



COORDINATED HIGHWAYS ACTION RESPONSE TEAM
STATE HIGHWAY ADMINISTRATION

WO 48 LCP Phase 4 Detailed Design

**Contract SHA-06-CHART
Document # WO48-DS-001
Work Order 48, Deliverable 4**

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By
CSC**

CSC

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1 Introduction

1.1 Purpose

This document describes the high level design of the software for Lane Closure Permits (LCP) Phase 4.

Following is a summary of the major features provided by LCP Phase 4:

- **System Announcements.**

The LCP System Announcements Module is a new feature that will be added that allows site administrators to post site wide announcements that all users will see.

- **Summary Reports**

- Permits By Route By Day
- Permits By County By Day
- Active By Date/Time By Route.
- Active By District By Date/Time or Date Range
- By Type By County By Date Range

- **Updates to LCP History Logs**

LCP Phase 4 will include updates to provide additional details in the LCP permit history when a permit is edited.

- **Prioritized PRs**

LCP Phase 4 will include a group of Level A PRs prioritized by SHA. The following 11 PRs will be addressed in this release:

- PR6837 LCP: Update reports to ignore fields and titles for blank entries (This feature was moved to WO49)
- PR6838 LCP: Streamline contacts and permittees user interface
- PR6841 LCP: Add the ability for users to edit remarks
- PR6845 LCP: Provide view only versions of list permits and permit reports
- PR7032 LCP: Add report to provide a total count on how many Lane Closure permits were entered for date range
- PR7094 LCP: DAPT for should have a submit button to provide a better user experience
- PR7104 LCP: Details pages for some permits are slow to load when their permit histories contain a lot of entries.
- PR7107 LCP: Users should not be able to delete permits after they have been approved.
- PR7174 LCP: Provide members of Create role the ability to edit permits
- PR7221 LCP: Investigate adding the ability to change usernames so they match MDOT login names
- PR7356 LCP: Unmapped Approve Permit

1.2 Objectives

The main objective of this detailed design document is to provide software developers with a framework in which to implement the requirements identified in the LCP Phase 4 Requirements document.

1.3 Scope

This design is limited to Phase 4 of the LCP system. This design does not include designs for components implemented in other releases of the LCP or CHART systems.

1.4 Design Process

This design is based on a series of Joint Application Design (JAD) sessions that were held with developers and stake holders. The requirements have been captured as Use Cases and translated into UML diagrams as basis for detailed design.

1.5 Design Tools

The use cases, database diagrams, sequence diagrams and state diagrams will be extracted from CSC Docs portal and the the Confluence project portal.

1.6 Work Products

This design document includes the following work products:

- Architecture diagram, showing the high level architecture of components related to this project.
- UML Class diagrams, showing the software objects which allow the system to accommodate the uses of the system described in the Use Cases from the requirements document.
- UML Sequence diagrams showing how the classes interact to accomplish major functions of the system.
- Requirement Verification Traceability Matrix that shows the mapping of specific requirements to use cases.

2 LCP Architecture

The sections below discuss specific elements of the architecture and software components that are created, changed, or used in LCP Phase 4.

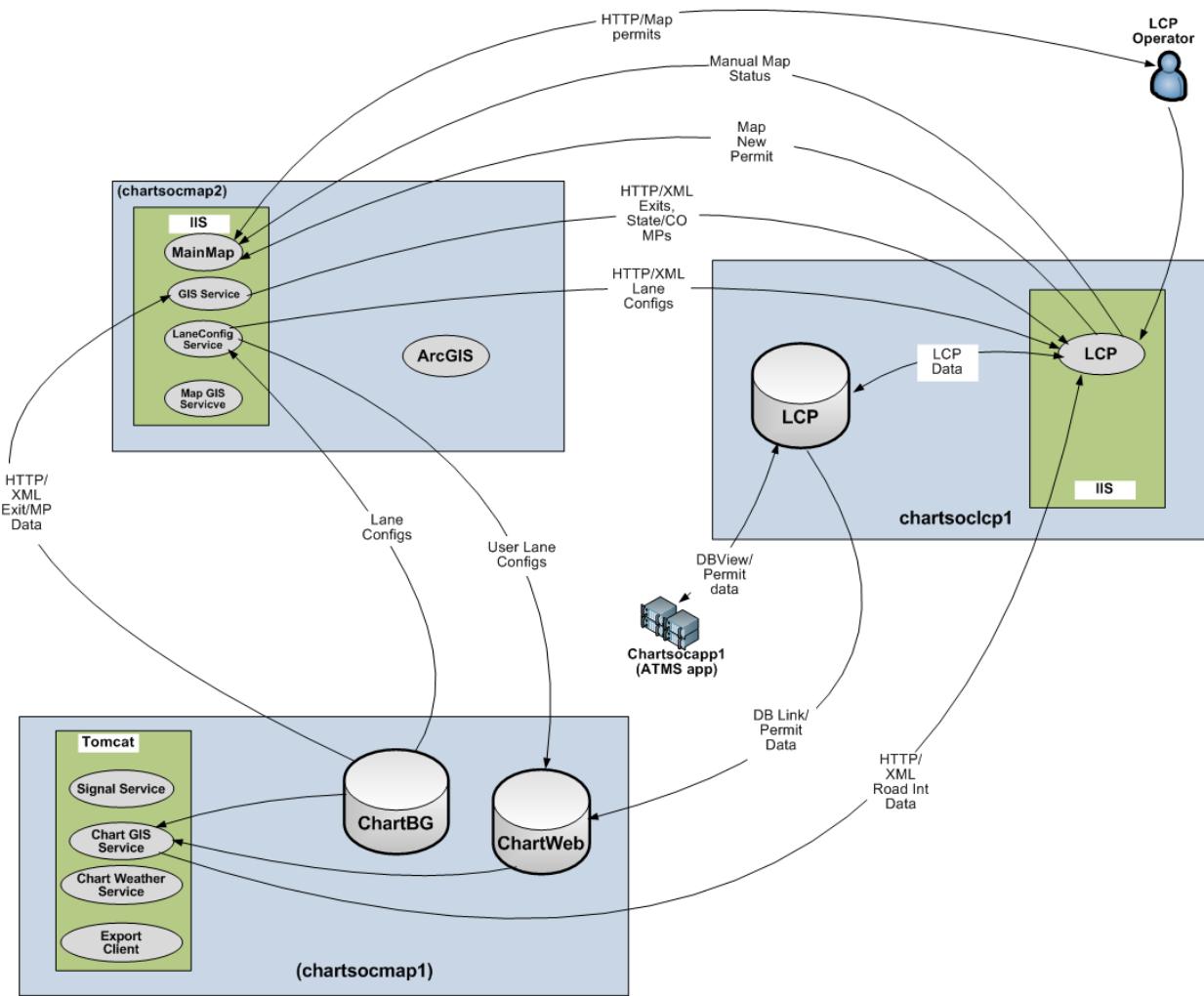


Figure 2-1 LCP Architecture Diagram

2.1 Network/Hardware

2.1.1 LCP

The LCP Phase 4 release will not require that a new server be added to the MDOT network. This release will utilize the existing LCP ASP.NET web server and Microsoft SQL Server database.

2.2 Software

2.2.1 LCP

LCP Phase 4 will use the Microsoft .NET Framework and ASP.NET MVC architecture for web application development. Data access will utilize the ADO.NET Entity Framework to perform Object-Relational Mapping for domain-specific objects.

2.2.2 COTS Products

Product Name	Description
Microsoft .Net Framework	LCP Release 4 will be built on the Microsoft .Net framework.
ASP.Net MVC	LCP Release 4 will use the ASP.NET Framework as the web application architecture. ASP.NET MVC implements the model-view-controller design pattern.
Microsoft SQL Server	LCP Release 4 uses Microsoft SQL Server as its database.
Microsoft Entity Framework	LCP Release 4 uses the Microsoft Entity Framework for data access.
JQuery	LCP Release 4 uses JQuery and JQuery plug-in for client side GUI manipulation and AJAX requests to the server.
Log4Net	LCP Release 4 uses Log4Net to log application errors.
SecurityGuard	LCP Release 4 uses SecurityGuard for membership management.

2.2.3 LCP Interfaces

The sections below contain detailed information related to interfaces in LCP system.

2.2.3.1.1 External Interfaces

This section describes the external interfaces for the LCP system. The diagram below depicts an overview of these interfaces.

§

Figure 2-2 LCP and External Interfaces

LCP interfaces with GIS and MapGIS services using the GIS and MapGIS web service interfaces to allow LCP to get location and lane configuration information for permits. The LCP Data Exporter provides an external interface for the CHART Intranet Map application. The primary purpose of the LCP Data Exporter is to provide an external interface to LCP data. However, it is also a convenient method for controlling data to other independent CHART applications such as the Intranet map and the public web site.

The Intranet Map and CHART Public Web Site receive their LCP permit data via an Export Client application that writes the standards-based messages to the Map database.

2.3 Security

2.3.1 LCP

LCP Release 4 will require no security updates to the existing LCP web application.

All external systems that connect to a LCP HTTPS/XML web service to obtain data from LCP are assigned a unique client ID and must be pre-configured in the CHART and LCP systems by an Administrator to allow access. A public/private key pair is generated by the Administrator for each external system, with the public key being stored in the CHART and LCP systems, and the private key being provided to the external system owner for their use when connecting to the LCP system. Each request received from an external system includes the external system client ID and a digital signature created with their private key. LCP validates all requests using the client's public key to ensure the request is from a trusted source.

2.4 LCP Data

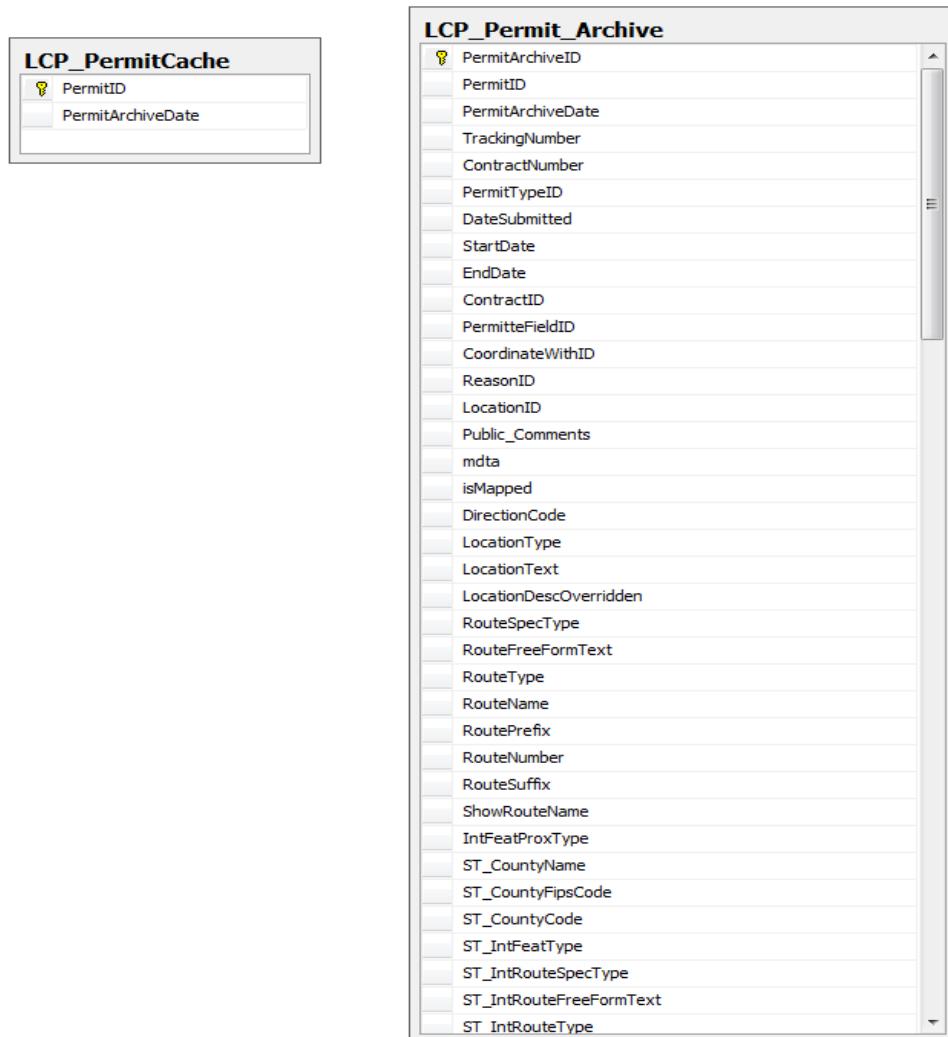
LCP Release 4 will be tested with the fielded version of Microsoft SQL Server.

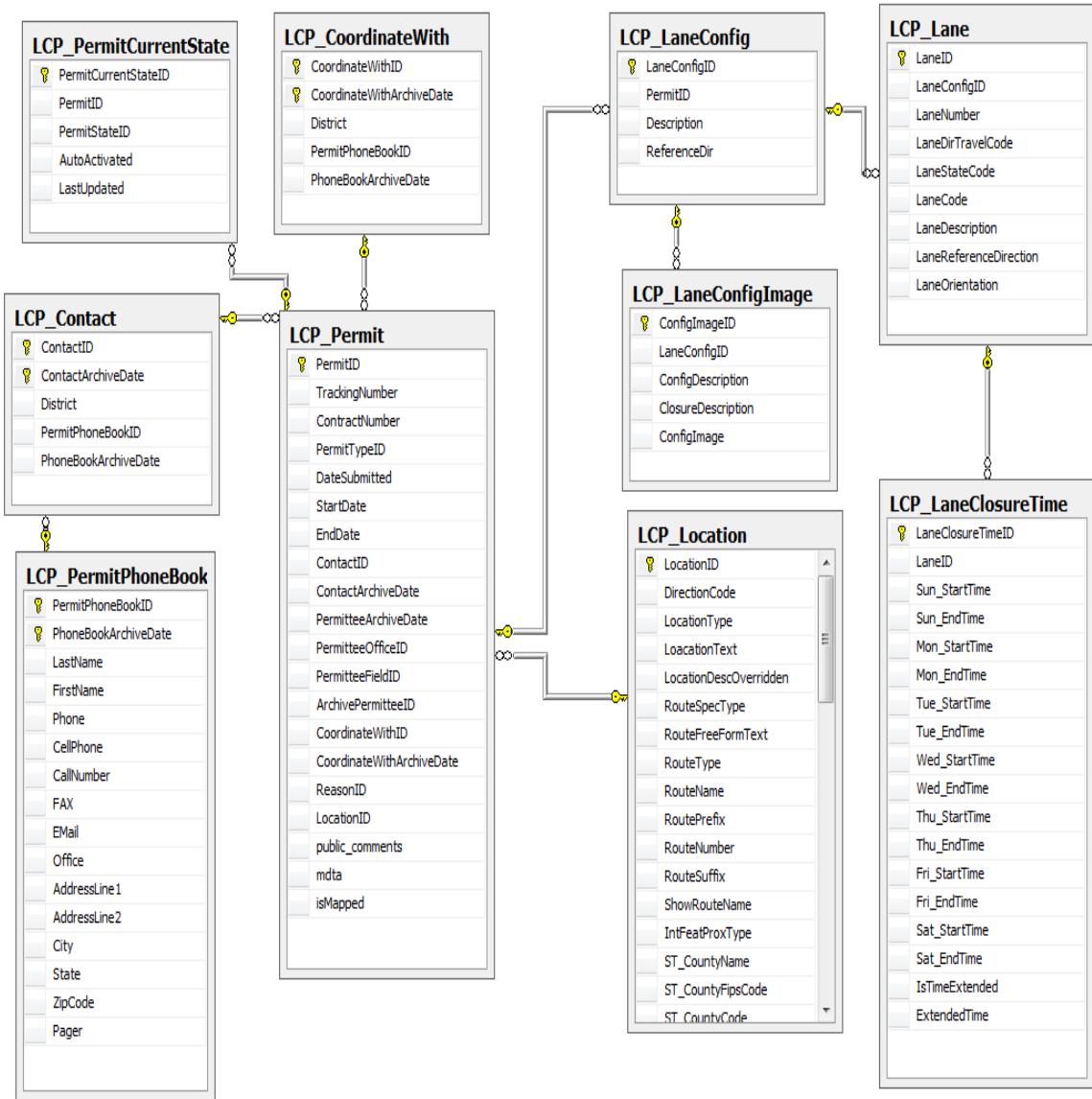
2.4.1 LCP Database

2.4.1.1 LCP Logical Design

2.4.1.1.1 LCP Entity Relationship Diagram (ERD)

LCP Phase 4 database entity relationship diagrams are shown below in the multiple pages of figures labeled collectively as one Figure. These diagrams represent the current LCP Phase 4 database design.





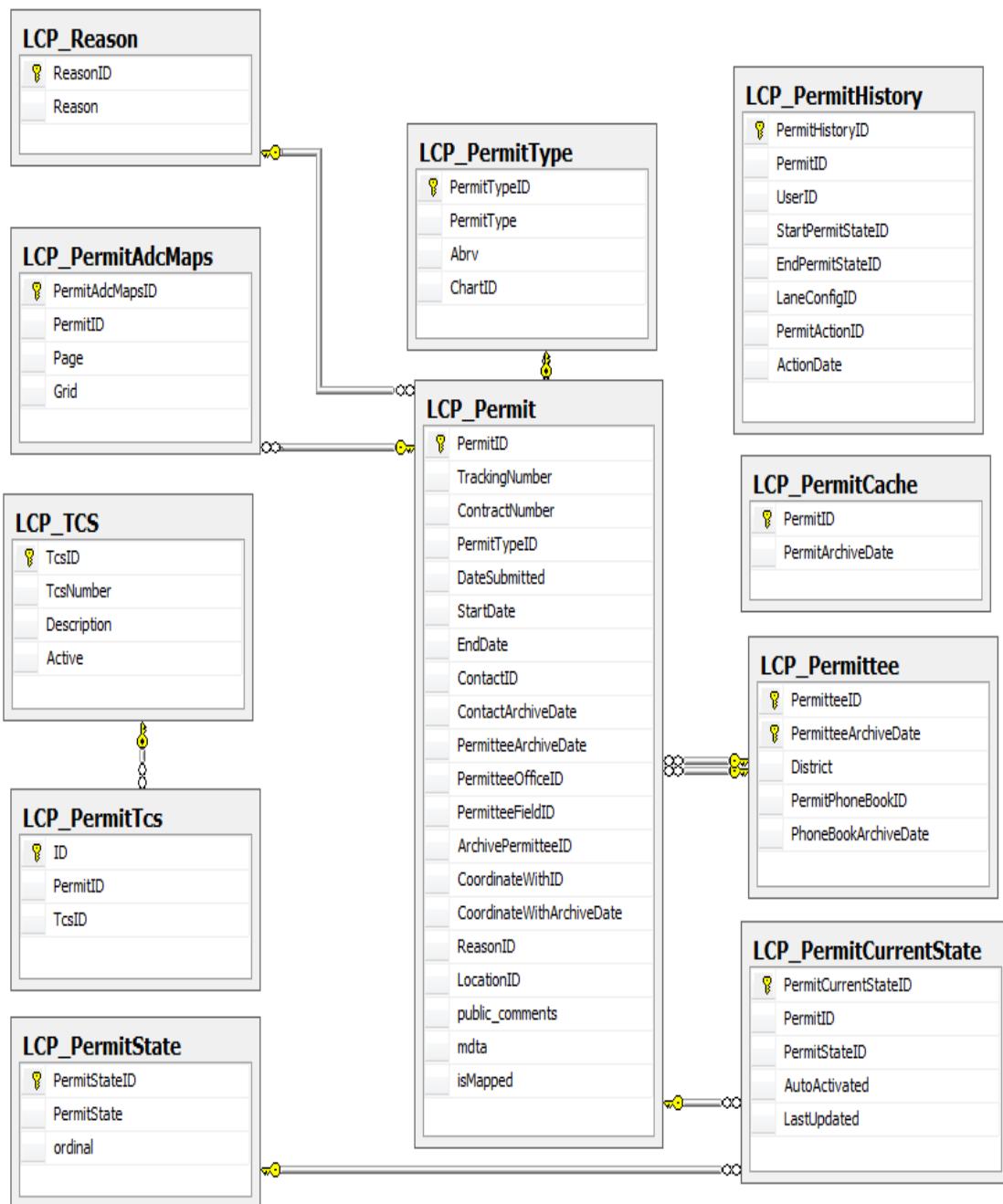


Figure 2-3 LCP Phase 4 ERD

2.4.1.2 Table Definition Report

2.4.1.2.1

LCP_Contact

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	ContactID	uniqueidentifier	True	TRUE	16	0	0		
TRUE	ContactArchiveDate	Date	True	TRUE	3	10	0		
FALSE	District	int	True	FALSE	4	10	0		
FALSE	PermitPhoneBookID	uniqueidentifier	True	FALSE	16	0	0		
FALSE	PhoneBookArchiveDate	datetime	True	FALSE	8	23	3		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes
ContactID	FK_LCP_Permit_LCP_Contact	
ContactArchiveDate	FK_LCP_Permit_LCP_Contact	

LCP_CoordinateWith

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes

TRUE	CoordinateWithID	unique identifier	True	TRUE	16	0	0		
TRUE	CoordinateWithArchiveDate	Date	True	TRUE	3	10	0		
FALSE	District	int	True	TRUE	4	10	0		
FALSE	PermitPhoneBookID	unique identifier	True	TRUE	16	0	0		
FALSE	PhoneBookArchiveDate	date	True	TRUE	8	23	3		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF__LCP_Coord_Coord__OF975522	DEFAULT_CONSTRAINT	CoordinateWithID	(newid())	

Relationships

Columns	Association	Notes
ContactID	FK_LCP_Permit_LCP_Contact	
ContactArchiveDate	FK_LCP_Permit_LCP_Contact	

LCP_Lane

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	LaneID	unique identifier	TRUE	TRUE	16	0	0		
FALSE	LaneConfigID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	LaneNumber	int	TRUE	FALSE	4	10	0		
FALSE	LaneDirTravelCode	int	TRUE	FALSE	4	10	0		
FALSE	LaneStateCode	int	TRUE	FALSE	4	10	0		
FALSE	LaneCode	int	TRUE	FALSE	4	10	0		
FALSE	LaneDescription	varchar	TRUE	FALSE	50	0	0		
FALSE	LaneReferenceDirection	int	TRUE	FALSE	4	10	0		
FALSE	LaneOrientation	int	TRUE	FALSE	4	10	0		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes

LCP_LaneClosureTime

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	LaneClosureTimeID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	LaneID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	Sun_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Sun_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Mon_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Mon_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Tue_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Tue_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Wed_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Wed_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Thu_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Thu_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Fri_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Fri_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Sat_StartTime	datetime	FALSE	FALSE	8	23	3		
FALSE	Sat_EndTime	datetime	FALSE	FALSE	8	23	3		
FALSE	IsTimeExtended	bit	TRUE	FALSE	1	1	0		
FALSE	ExtendedTime	datetime	FALSE	FALSE	8	23	3		

Constraints

Columns	Type	Columns	Initial Code	Notes

DF__LCP_LaneC__LaneC_1 B0907CE	DEFAULT_CONSTRAINT	LaneClosureTimeID	(newid())	
DF__LCP_LaneC__IsTim_1 BFD2C07	DEFAULT_CONSTRAINT	IsTimeExtended	((0))	

Relationships

Columns	Association	Notes

LCP_LaneConfig

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	LaneConfigID	unique identifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	Description	varchar	FALSE	FALSE	250	0	0		
FALSE	ReferenceDir	int	FALSE	FALSE	4	10	0		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes
LaneConfigID	FK_LCP_Lane_LCP_LaneConfig_LaneConfig	
LaneConfigID	FK_LaneConfigImage_LCP_LaneConfig	

LCP_LaneConfigImage

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	ConfigImageID	unique identifier	TRUE	TRUE	16	0	0		

FALSE	LaneConfigID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	ConfigDescription	varchar	FALSE	FALSE	250	0	0		
FALSE	ClosureDescription	varchar	FALSE	FALSE	250	0	0		
FALSE	ConfigImage	varchar	FALSE	FALSE	-1	0	0		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes

LCP_Permit

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitID	unique identifier	TRUE	TRUE	16	0	0		
FALSE	TrackingNumber	varchar	TRUE	FALSE	50	0	0		
FALSE	ContractNumber	varchar	FALSE	FALSE	50	0	0		
FALSE	PermitTypeID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	DateSubmitted	datetime	TRUE	FALSE	8	23	3		
FALSE	StartDate	date	TRUE	FALSE	3	10	0		
FALSE	EndDate	date	TRUE	FALSE	3	10	0		
FALSE	ContactID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	ContactArchiveDate	date	TRUE	FALSE	3	10	0		
FALSE	PermitteeArchiveDate	date	TRUE	FALSE	3	10	0		

FALSE	PermitteeOfficeID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	PermitteeFieldID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	ArchivePermitteeID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	CoordinateWithID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	CoordinateWithArchiveDate	date	TRUE	FALSE	3	10	0		
FALSE	ReasonID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	LocationID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	public_comments	varchar	FALSE	FALSE	-1	0	0		
FALSE	mdta	bit	TRUE	FALSE	1	1	0		
FALSE	isMapped	bit	TRUE	FALSE	1	1	0		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes
PermitID	FK_LCP_LaneConfig_LCP_Permit	
PermitID	FK_LCP_PermitAdcMaps_LCP_Permit	
PermitID	FK_LCP_PermitCurrentState_LCP_Permit	
PermitID	FK_LCP_PermitCurrentState_LCP_Permit1	

LCP_Location

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes

TRUE	LocationID	unique identifier	TRUE	TRUE	16	0	0		
FALSE	DirectionCode	int	FALSE	FALSE	4	10	0		
FALSE	LocationType	numeric	FALSE	FALSE	5	3	0		
FALSE	LoacationText	varchar	FALSE	FALSE	1024	0	0		
FALSE	LocationDescOverridden	bit	FALSE	FALSE	1	1	0		
FALSE	RouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	RouteFreeFormText	varchar	FALSE	FALSE	255	0	0		
FALSE	RouteType	int	FALSE	FALSE	4	10	0		
FALSE	RouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	RoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	RouteNumber	varchar	FALSE	FALSE	10	0	0		
FALSE	RouteSuffix	varchar	FALSE	FALSE	10	0	0		
FALSE	ShowRouteName	bit	FALSE	FALSE	1	1	0		
FALSE	IntFeatProxType	int	FALSE	FALSE	4	10	0		
FALSE	ST_CountyName	varchar	FALSE	FALSE	50	0	0		
FALSE	ST_CountyFipsCode	char	FALSE	FALSE	3	0	0		
FALSE	ST_CountyCode	varchar	FALSE	FALSE	3	0	0		
FALSE	ST_IntFeatType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntRouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntRouteFreeFormText	varchar	FALSE	FALSE	50	0	0		
FALSE	ST_IntRouteType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntRouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	ST_IntRoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	ST_IntRouteNumber	varchar	FALSE	FALSE	10	0	0		
FALSE	ST_IntRouteSuffix	varchar	FALSE	FALSE	4	0	0		
FALSE	ST_ShowIntFeatRouteName	bit	FALSE	FALSE	1	1	0		
FALSE	ST_IntFeatMilepostType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntFeatMilliMilepostData	numeric	FALSE	FALSE	5	6	0		

FALSE	ST_IntFeatExitNumber	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntFeatExitSuffix	varchar	FALSE	FALSE	16	0	0		
FALSE	ST_IntFeatExitRouteName	varchar	FALSE	FALSE	96	0	0		
FALSE	ST_LatitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	ST_LongitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	END_CountyName	varchar	FALSE	FALSE	50	0	0		
FALSE	END_CountyFipsCode	char	FALSE	FALSE	3	0	0		
FALSE	END_CountyCode	varchar	FALSE	FALSE	3	0	0		
FALSE	END_IntFeatType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteFreeFormText	varchar	FALSE	FALSE	50	0	0		
FALSE	END_IntRouteType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	END_IntRoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	END_IntRouteNumber	varchar	FALSE	FALSE	10	0	0		
FALSE	END_IntRouteSuffix	varchar	FALSE	FALSE	4	0	0		
FALSE	END_IntFeatMilepostType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntFeatMilliMilepostData	numeric	FALSE	FALSE	5	6	0		
FALSE	END_IntFeatExitNumber	int	FALSE	FALSE	4	10	0		
FALSE	END_IntFeatExitSuffix	varchar	FALSE	FALSE	16	0	0		
FALSE	END_IntFeatExitRouteName	varchar	FALSE	FALSE	96	0	0		
FALSE	END_ShowIntFeatRouteName	bit	FALSE	FALSE	1	1	0		
FALSE	END_LatitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	END_LongitudeUdeg	decimal	FALSE	FALSE	9	16	6		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes
LocationID	FK_LCP_Permit_LCP_Location	

LCP_Permit_Archive

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitArchiveID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	PermitArchiveDate	date	TRUE	FALSE	3	10	0		
FALSE	TrackingNumber	varchar	TRUE	FALSE	50	0	0		
FALSE	ContractNumber	varchar	FALSE	FALSE	50	0	0		
FALSE	PermitTypeID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	DateSubmitted	datetime	TRUE	FALSE	8	23	3		
FALSE	StartDate	datetime	TRUE	FALSE	8	23	3		
FALSE	EndDate	datetime	TRUE	FALSE	8	23	3		
FALSE	ContractID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	PermitteFieldID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	CoordinateWithID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	ReasonID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	LocationID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	Public_Comments	varchar	FALSE	FALSE	-1	0	0		
FALSE	mdta	bit	TRUE	FALSE	1	1	0		
FALSE	isMapped	bit	TRUE	FALSE	1	1	0		

FALSE	DirectionCode	int	FALSE	FALSE	4	10	0		
FALSE	LocationType	numeric	FALSE	FALSE	5	3	0		
FALSE	LocationText	varchar	FALSE	FALSE	1024	0	0		
FALSE	LocationDescOverridden	bit	FALSE	FALSE	1	1	0		
FALSE	RouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	RouteFreeFormText	varchar	FALSE	FALSE	255	0	0		
FALSE	RouteType	int	FALSE	FALSE	4	10	0		
FALSE	RouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	RoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	RouteNumber	varchar	FALSE	FALSE	10	0	0		
FALSE	RouteSuffix	varchar	FALSE	FALSE	10	0	0		
FALSE	ShowRouteName	bit	FALSE	FALSE	1	1	0		
FALSE	IntFeatProxType	int	FALSE	FALSE	4	10	0		
FALSE	ST_CountyName	varchar	FALSE	FALSE	50	0	0		
FALSE	ST_CountyFipsCode	char	FALSE	FALSE	3	0	0		
FALSE	ST_CountyCode	varchar	FALSE	FALSE	3	0	0		
FALSE	ST_IntFeatType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntRouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntRouteFreeFormText	varchar	FALSE	FALSE	50	0	0		
FALSE	ST_IntRouteType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntRouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	ST_IntRoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	ST_IntRouteNumber	varchar	FALSE	FALSE	10	0	0		
FALSE	ST_IntRouteSuffix	varchar	FALSE	FALSE	4	0	0		
FALSE	ST_ShowIntFeatRouteName	bit	FALSE	FALSE	1	1	0		
FALSE	ST_IntFeatMilepostType	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntFeatMilliMilepostData	numeric	FALSE	FALSE	5	6	0		

FALSE	ST_IntFeatExitNumber	int	FALSE	FALSE	4	10	0		
FALSE	ST_IntFeatExitSuffix	varchar	FALSE	FALSE	16	0	0		
FALSE	ST_IntFeatExitRouteName	varchar	FALSE	FALSE	96	0	0		
FALSE	ST_LatitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	ST_LongitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	END_CountyName	varchar	FALSE	FALSE	50	0	0		
FALSE	END_CountyFipsCode	char	FALSE	FALSE	3	0	0		
FALSE	END_CountyCode	char	FALSE	FALSE	3	0	0		
FALSE	END_IntFeatType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteFreeFormText	varchar	FALSE	FALSE	50	0	0		
FALSE	END_IntRouteType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	END_IntRoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	ST_IntFeatExitRouteName	varchar	FALSE	FALSE	96	0	0		
FALSE	ST_LatitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	ST_LongitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	END_CountyName	varchar	FALSE	FALSE	50	0	0		
FALSE	END_CountyFipsCode	char	FALSE	FALSE	3	0	0		
FALSE	END_CountyCode	char	FALSE	FALSE	3	0	0		
FALSE	END_IntFeatType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteSpecType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteFreeFormText	varchar	FALSE	FALSE	50	0	0		
FALSE	END_IntRouteType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntRouteName	varchar	FALSE	FALSE	50	0	0		
FALSE	END_IntRoutePrefix	varchar	FALSE	FALSE	10	0	0		
FALSE	END_IntRouteNumber	varchar	FALSE	FALSE	10	0	0		

FALSE	END_IntRouteSuffix	varchar	FALSE	FALSE	4	0	0		
FALSE	END_IntFeatMilepostType	int	FALSE	FALSE	4	10	0		
FALSE	END_IntFeatMilliMilepostData	numeric	FALSE	FALSE	5	6	0		
FALSE	END_IntFeatExitNumber	int	FALSE	FALSE	4	10	0		
FALSE	END_IntFeatExitSuffix	varchar	FALSE	FALSE	16	0	0		
FALSE	END_IntFeatExitRouteName	varchar	FALSE	FALSE	96	0	0		
FALSE	END_ShowIntFeatRouteName	bit	FALSE	FALSE	1	1	0		
FALSE	END_LatitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	END_LongitudeUdeg	decimal	FALSE	FALSE	9	16	6		
FALSE	LaneID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	LaneNumber	int	TRUE	FALSE	4	10	0		
FALSE	LaneDirTravelCode	int	TRUE	FALSE	4	10	0		
FALSE	LaneStateCode	int	TRUE	FALSE	4	10	0		
FALSE	LaneDescription	varchar	TRUE	FALSE	50	0	0		
FALSE	LaneReferenceDirection	int	TRUE	FALSE	4	10	0		
FALSE	LaneOrientation	int	TRUE	FALSE	4	10	0		
FALSE	ConfigImageID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	LaneConfigID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	ConfigDescription	varchar	FALSE	FALSE	250	0	0		
FALSE	ClosureDescription	varchar	FALSE	FALSE	250	0	0		
FALSE	ConfigImage	varchar	FALSE	FALSE	-1	0	0		
FALSE	Description	varchar	FALSE	FALSE	250	0	0		
FALSE	ReferenceDir	int	FALSE	FALSE	4	10	0		
FALSE	District	int	TRUE	FALSE	4	10	0		
FALSE	PermitPhoneBookID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	PermitHistoryID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	UserID	uniqueidentifier	TRUE	FALSE	16	0	0		

FALSE	StartPermitStateID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	EndPermitStateID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	PermitActionID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	ActionDate	datetime	TRUE	FALSE	8	23	3		
FALSE	PermitType	varchar	TRUE	FALSE	50	0	0		
FALSE	Abrv	varchar	TRUE	FALSE	5	0	0		
FALSE	ChartID	int	FALSE	FALSE	4	10	0		
FALSE	LastName	varchar	FALSE	FALSE	50	0	0		
FALSE	FirstName	varchar	FALSE	FALSE	50	0	0		
FALSE	Phone	varchar	FALSE	FALSE	50	0	0		
FALSE	CellPhone	varchar	FALSE	FALSE	50	0	0		
FALSE	CallNumber	varchar	FALSE	FALSE	50	0	0		
FALSE	FAX	varchar	FALSE	FALSE	50	0	0		
FALSE	EMail	varchar	FALSE	FALSE	255	0	0		
FALSE	Office	varchar	FALSE	FALSE	255	0	0		
FALSE	AddressLine1	varchar	FALSE	FALSE	255	0	0		
FALSE	AddressLine2	varchar	FALSE	FALSE	255	0	0		
FALSE	City	varchar	FALSE	FALSE	50	0	0		
FALSE	State	varchar	TRUE	FALSE	50	0	0		
FALSE	ZipCode	varchar	FALSE	FALSE	10	0	0		
FALSE	Pager	varchar	FALSE	FALSE	50	0	0		
FALSE	PermitCurrentState ID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	PermitStateID	unique identifier	TRUE	FALSE	16	0	0		
FALSE	AutoActivated	bit	TRUE	FALSE	1	1	0		
FALSE	LastUpdated	datetime	TRUE	FALSE	8	23	3		
FALSE	PermitState	varchar	TRUE	FALSE	50	0	0		
FALSE	ordinal	int	FALSE	FALSE	4	10	0		

FALSE	PermitAdcMapsID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	Page	varchar	TRUE	FALSE	50	0	0		
FALSE	Grid	varchar	TRUE	FALSE	50	0	0		
FALSE	ContactArchiveID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	ContactID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	ID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	TcsID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	TcsNumber	varchar	TRUE	FALSE	50	0	0		
FALSE	TCS_Description	varchar	TRUE	FALSE	250	0	0		
FALSE	Active	bit	TRUE	FALSE	1	1	0		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes

LCP_PermitAdcMaps

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitAdcMapsID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	uniqueidentifier	TRUE	FALSE	16	0	0		

FALSE	Page	varchar	TRUE	FALSE	50	0	0			
FALSE	Grid	varchar	TRUE	FALSE	50	0	0			

Constraints

Columns	Type	Columns	Initial Code	Notes
DF__LCP_PermitID	DEFAULT_CONSTRAINT	PermitAdcMapsID	(newid())	

Relationships

Columns	Association	Notes

LCP_PermitCache

Database: SQL Server 2008, *Stereotype:* «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	PermitArchiveDate	datetime	TRUE	FALSE	8	23	3		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes

LCP_PermitCurrentState

Database: SQL Server 2008, *Stereotype:* «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitCurrentStateID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	uniqueidentifier	TRUE	FALSE	16	0	0		

FALSE	PermitStateID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	AutoActivated	bit	TRUE	FALSE	1	1	0		
FALSE	LastUpdated	datetime	TRUE	FALSE	8	23	3		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF__LCP_Permi__Permi__4E 88ABD4	DEFAULT_CONSTRAINT	PermitCurrentStateID	(newid())	
DF__LCP_Permi__AutoA__4 F7CD00D	DEFAULT_CONSTRAINT	AutoActivated	((0))	
DF__LCP_Permi__LastU__50 70F446	DEFAULT_CONSTRAINT	LastUpdated	(getdate())	

Relationships

Columns	Association	Notes
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LCP_PermitHistory

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitHistoryID	uniqueid entifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	UserID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	StartPermitStateID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	EndPermitStateID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	LaneConfigID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	PermitActionID	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	ActionDate	datetime	TRUE	FALSE	8	23	3		
TRUE	PermitHistoryID	uniqueid entifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	uniqueid entifier	TRUE	FALSE	16	0	0		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF__LCP_PermitHistoryID_969D2E	DEFAULT_CONSTRAINT	PermitHistoryID	(newid())	
DF__LCP_PermitActionDate_8AC167	DEFAULT_CONSTRAINT	ActionDate	(getdate())	

Relationships

Columns	Association	Notes
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LCP_PermitPhoneBook

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitPhoneBookID	uniqueidentifier	TRUE	TRUE	16	0	0		
TRUE	PhoneBookArchiveDate	datetime	TRUE	TRUE	8	23	3		
FALSE	LastName	varchar	FALSE	FALSE	50	0	0		
FALSE	FirstName	varchar	FALSE	FALSE	50	0	0		
FALSE	Phone	varchar	FALSE	FALSE	50	0	0		
FALSE	CellPhone	varchar	FALSE	FALSE	50	0	0		
FALSE	CallNumber	varchar	FALSE	FALSE	50	0	0		
FALSE	FAX	varchar	FALSE	FALSE	50	0	0		
FALSE	EMail	varchar	FALSE	FALSE	255	0	0		
FALSE	Office	varchar	FALSE	FALSE	255	0	0		
FALSE	AddressLine1	varchar	FALSE	FALSE	255	0	0		
FALSE	AddressLine2	varchar	FALSE	FALSE	255	0	0		
FALSE	City	varchar	FALSE	FALSE	50	0	0		
FALSE	State	varchar	TRUE	FALSE	50	0	0		
FALSE	ZipCode	varchar	FALSE	FALSE	10	0	0		
FALSE	Pager	varchar	FALSE	FALSE	50	0	0		

Constraints

Columns	Type	Columns	Initial Code	Notes
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Relationships

Columns	Association	Notes
PermitPhoneBookID	FK_LCP_Contact_LCP_PermitPhoneBook	
PhoneBookArchiveDate	FK_LCP_Contact_LCP_PermitPhoneBook	

PermitPhoneBookID	FK_LCP_Permittee_LCP_PermitPhoneBook	
PhoneBookArchiveDate	FK_LCP_Permittee_LCP_PermitPhoneBook	

LCP_PermitState

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitStateID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	PermitState	varchar	TRUE	FALSE	50	0	0		
FALSE	ordinal	int	FALSE	FALSE	4	10	0		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF__LCP_Permit_Permit_4AB81AF0	DEFAULT_CONSTRAINT	PermitStateID	(newid())	

Relationships

Columns	Association	Notes
PermitStateID	FK_LCP_PermitCurrentState_LCP_PermitState_PermitStateID	

LCP_PermitTcs

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	ID	uniqueidentifier	TRUE	TRUE	16	0	0		
FALSE	PermitID	uniqueidentifier	TRUE	FALSE	16	0	0		
FALSE	TcsID	uniqueidentifier	TRUE	FALSE	16	0	0		

Constraints

Columns	Type	Columns	Initial Code	Notes

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Relationships

Columns	Association	Notes

LCP_Permittee

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	PermitteeID	uniqueid entifier	TRUE	TRUE	16	0	0		
TRUE	PermitteeArchiveDa te	date	TRUE	TRUE	3	10	0		
FALSE	District	int	TRUE	FALSE	4	10	0		
FALSE	PermitPhoneBookI D	uniqueid entifier	TRUE	FALSE	16	0	0		
FALSE	PhoneBookArchive Date	datetime	TRUE	FALSE	8	23	3		

Constraints

Columns	Type	Columns	Initial Code	Notes

Relationships

Columns	Association	Notes
PermitteeArchiv eDate	FK_LCP_Permit_LCP_Permittee	
PermitteeID	FK_LCP_Permit_LCP_Permittee	

LCP_PermitType

Database: SQL Server 2008, Stereotype: «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes

TRUE	PermitTypeID	uniqueid entifier	TRUE	TRUE	16	0	0		
FALSE	PermitType	varchar	TRUE	FALSE	50	0	0		
FALSE	Abrv	varchar	TRUE	FALSE	5	0	0		
FALSE	ChartID	int	FALSE	FALSE	4	10	0		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF_LCP_Permit_Permit_5 DCAEF64	DEFAULT_CONSTRAINT	PermitTypeID	(newid())	

Relationships

Columns	Association	Notes
PermitTypeID	FK_LCP_Permit_LCP_PermitType	

LCP_Reason

Database: SQL Server 2008, *Stereotype:* «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Uniqu e	Len	Prec	Scale	Init	Notes
TRUE	ReasonID	uniqueid entifier	TRUE	TRUE	16	0	0		
FALSE	Reason	varchar	TRUE	FALSE	50	0	0		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF_LCP_Reaso_Reaso_60 A75C0F	DEFAULT_CONSTRAINT	ReasonID	(newid())	

Relationships

Columns	Association	Notes
ReasonID	FK_LCP_Permit_LCP_Reason	

LCP_TCS

Database: SQL Server 2008, *Stereotype:* «table»

Detail: Created on 8/26/2014. Last modified on 8/26/2014.

Notes:

Columns

PK	Name	Type	Not Null	Unique	Len	Prec	Scale	Init	Notes
TRUE	TcsID	uniqueid entifier	TRUE	TRUE	16	0	0		
FALSE	TcsNumber	varchar	TRUE	FALSE	50	0	0		
FALSE	Description	varchar	TRUE	FALSE	250	0	0		
FALSE	Active	bit	TRUE	FALSE	1	1	0		

Constraints

Columns	Type	Columns	Initial Code	Notes
DF_LCP_TCS_Active_56 29CD9C	DEFAULT_CONSTRAINT	Active	((1))	

Relationships

Columns	Association	Notes
TcsID	FK_LCP_PermitTcs_LCP_TCS_TcsID	

In addition, the following table will be added to the CHARTWeb database for the export client to cache the permits.

WT_LCP_Closures

Database: SQL Server 2008, Stereotype: «table»

Columns

PK	Name	Type
TRUE	PermitID	[uniqueidentifier] NOT NULL
FALSE	TrackingNumber	[varchar](50) NOT NULL
FALSE	PermitType	[varchar](50) NOT NULL
FALSE	TCSNumber	[varchar](500) NULL
FALSE	Reason	[varchar](50) NULL,
FALSE	DateSubmitted	[datetime] NOT NULL
FALSE	ContactName	[varchar](max) NULL
FALSE	PermitteeOfficeName	[varchar](max) NULL
FALSE	PermitteeFieldName	[varchar](max) NULL
FALSE	CoordinateWithName	[varchar](max) NULL
FALSE	ApprovalName	[varchar](max) NULL
FALSE	ApprovalDate	[datetime] NULL
FALSE	ST_CountyName	[varchar](75) NULL
FALSE	End_CountyName	[varchar](75) NULL
FALSE	RoutePrefix	[varchar](10) NULL
FALSE	RouteNumber	[varchar](10) NULL
FALSE	RouteName	[varchar](50) NULL
FALSE	RouteFreeFormText	[varchar](255) NULL
FALSE	RouteType	[int] NOT NULL
FALSE	StartDate	[datetime] NULL
FALSE	EndDate	[datetime] NULL
FALSE	Remarks	[varchar](max) NULL
FALSE	PermitStatus	[varchar](50) NOT NULL
FALSE	LocationText	[varchar](1024) NULL
FALSE	ST_LatitudeUdeg	[decimal](16, 6) NULL
FALSE	ST_LongitudeUdeg	[decimal](16, 6) NULL
FALSE	END_LatitudeUdeg	[decimal](16, 6) NULL
FALSE	END_LongitudeUdeg	[decimal](16, 6) NULL
FALSE	time_from	[varchar](8) NULL
FALSE	time_to	[varchar](8) NULL
FALSE	direction	[varchar](50) NULL
FALSE	ClosureDescription	[varchar](250) NULL
FALSE	ConfigDescription	[varchar](250) NULL
FALSE	ConfigImage	[varchar](max) NULL
FALSE	days_closed	[varchar](max) NULL
FALSE	PublicComments	[varchar](max) NULL
FALSE	MappingCounty	[varchar](2) NULL
FALSE	IsTimeExtended	[bit] NOT NULL
FALSE	active	[bit] NOT NULL
FALSE	mdshaDistrictNum	[int] NULL
FALSE	ExtendedTime	[int] NULL
FALSE	lastUpdateTime	[datetime] NULL

3 Key Design Concepts

3.1 LCP

The LCP Phase 4 application will contain a standard n-tier Model-View-Controller architecture to separate the presentation of information from the user's interaction with it. The model consists of application data and business rules, and the controller mediates input, converting it to commands for the model or view.

In addition to dividing the application into three kinds of components, the MVC design defines the interactions between them.

A **controller** can send commands to its associated view to change the view's presentation of the model (e.g., by scrolling through a document). It can send commands to the model to update the model's state (e.g., editing a document).

A **model** notifies its associated views and controllers when there has been a change in its state. This notification allows the views to produce updated output, and the controllers to change the available set of commands. A *passive* implementation of MVC omits these notifications, because the application does not require them or the software platform does not support them.

A **view** requests from the model the information that it needs to generate an output representation.

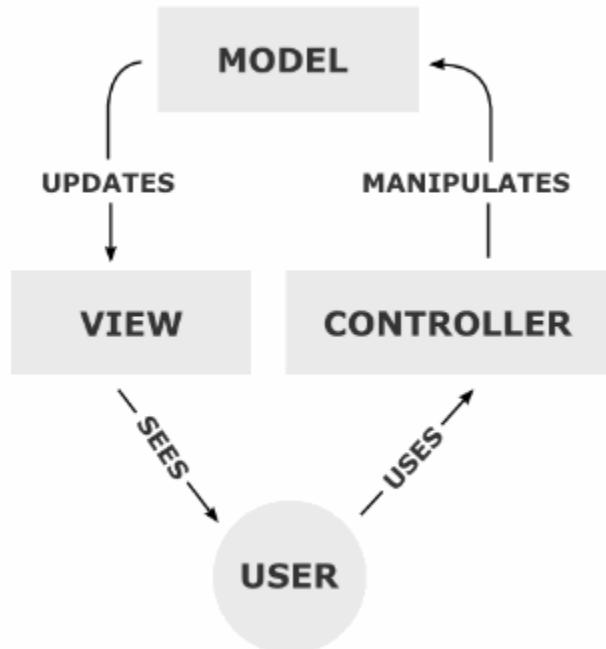


Figure 3-1 Model-View-Controller

3.2 System Announcements

The System Announcements module will consist of a backend administrator module used to manage announcements and additional modifications to the LCP application header UI to display the announcement message.

The administrator backend module will provide the ability for an administrator to list, add, edit and delete system announcement messages as well as the ability to activate and deactivate system announcements.

Changes to the LCP website header will provide the application with the ability to display active system announcements site-wide.

3.2.1 Class Design

The System Announcements module will use three primary classes:

- SystemAnnouncementController – provides a centralized controller for routing method calls.
- SystemAnnouncementViewModel – provides a data model designed for the view.
- LCP_SystemAnnouncement – provides and object for holding the announcement details.

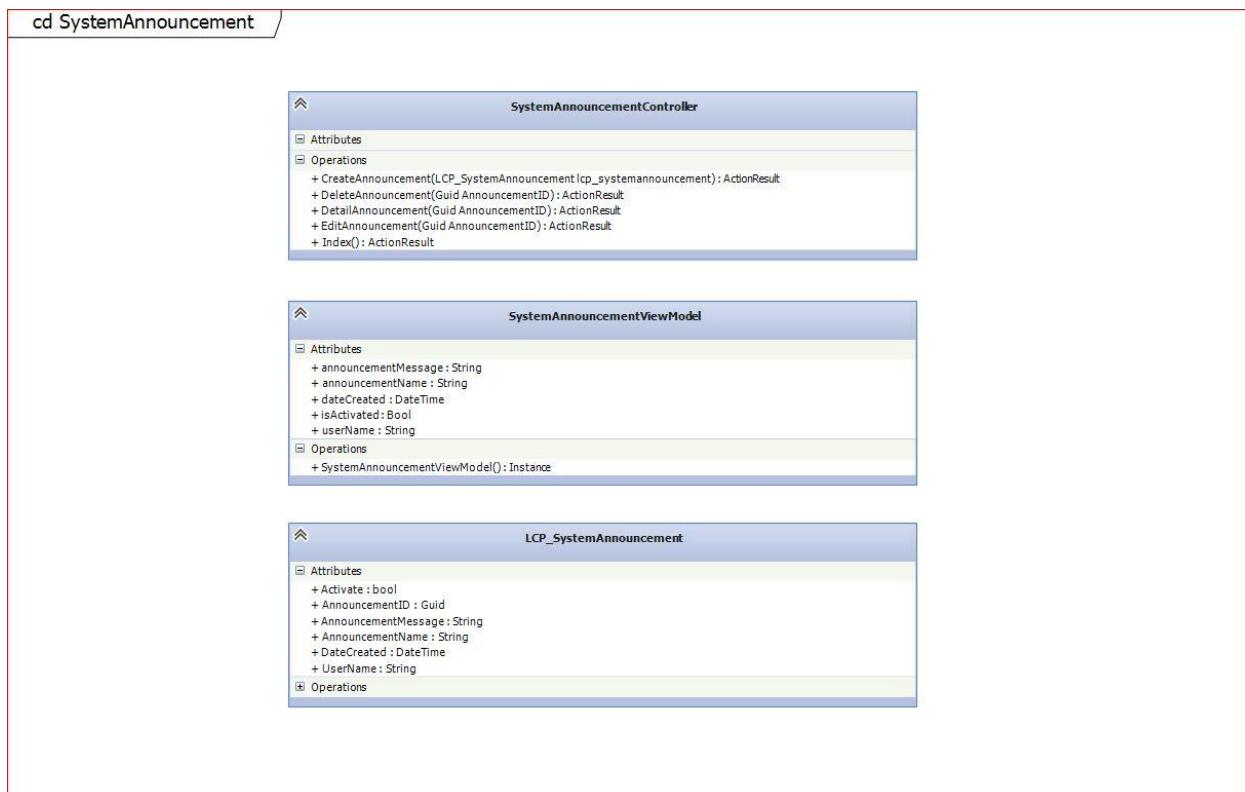


Figure 3-2 System Announcements Class Design

3.2.1 Database Design

The System Announcements module will utilize a new database table named LCP_SystemAnnouncement.



Figure 3-3 System Announcements Database Design

```
CREATE TABLE [dbo].[LCP_SystemAnnouncement](
[AnnouncementID] [uniqueidentifier] NOT NULL,
[AnnouncementName] [varchar](1024) NOT NULL,
[AnnouncementMessage] [varchar](2000) NOT NULL,
[DateCreated] [datetime] NOT NULL,
[UserName] [varchar](50) NOT NULL,
[IsActivated] [bit] NOT NULL,
CONSTRAINT [PK_LCP_SystemAnnouncement] PRIMARY KEY CLUSTERED
(
[AnnouncementID] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF,
ALLOW_ROW_LOCKS = ON, ALLOW_PAGE_LOCKS = ON) ON [PRIMARY]
) ON [PRIMARY]
GO
```

3.2.1 Sequence Diagrams

The following sequence diagrams describe the interactions between the classes in the System Announcements module.

3.2.1.1 List System Announcement Sequence Diagram

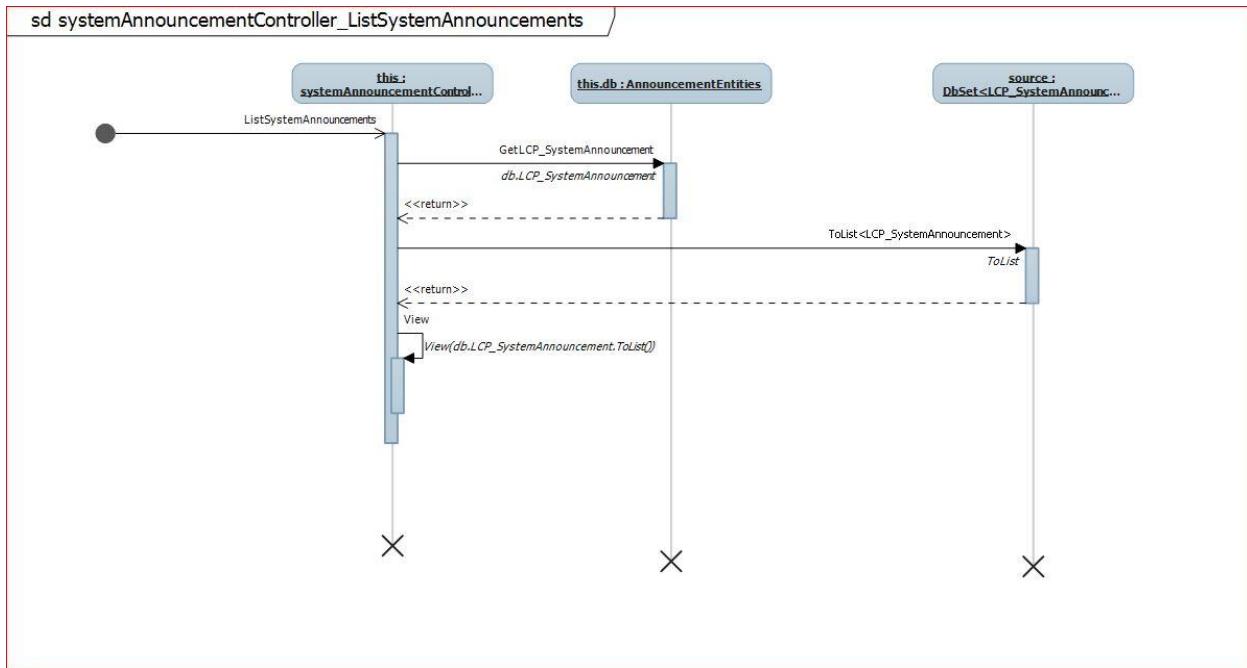


Figure 3-4 List System Announcements Sequence Diagram

3.2.1.2 Create New System Announcement Sequence Diagram

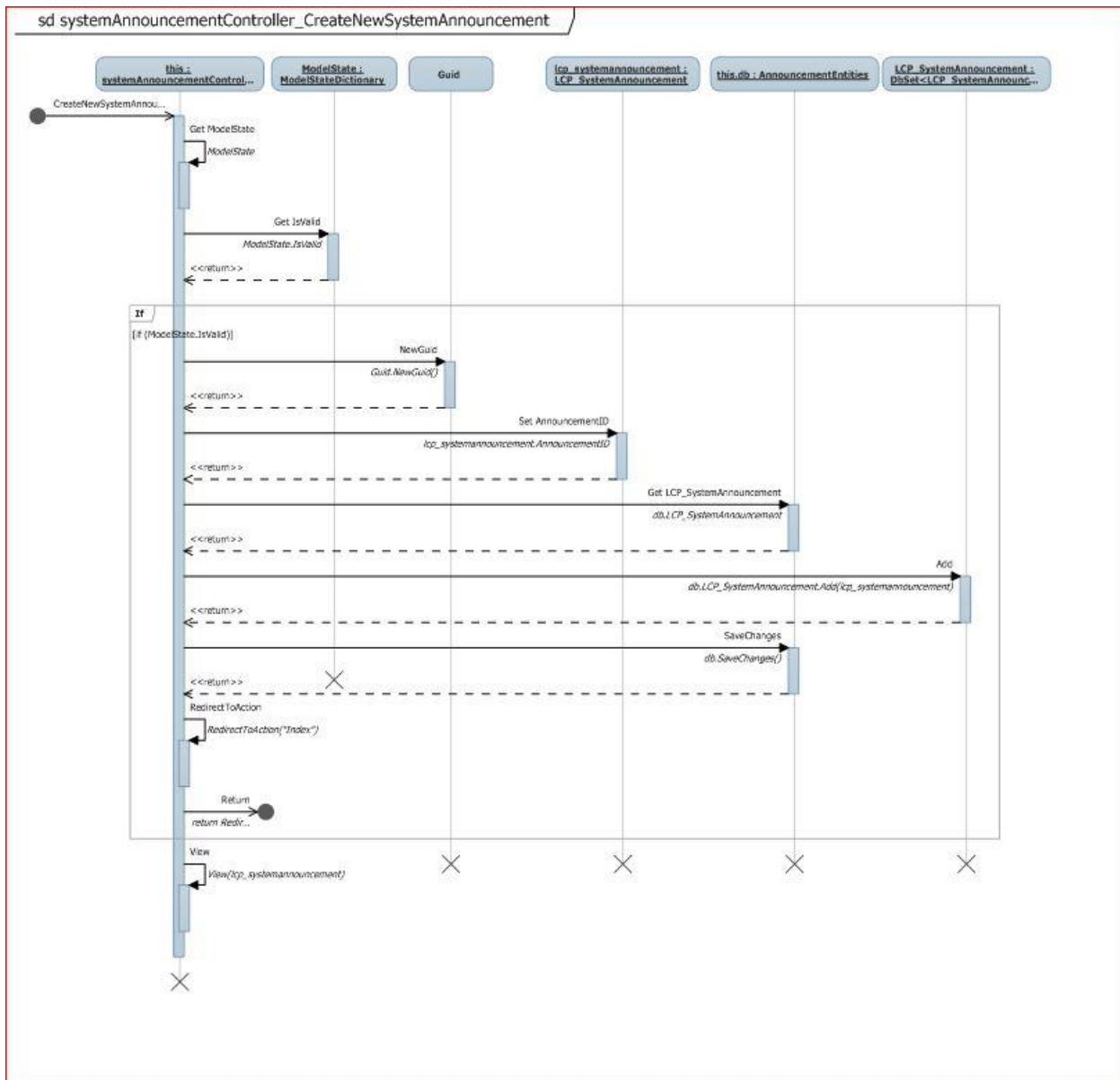


Figure 3-5 Create New System Announcement Sequence Diagram

3.2.1.3 Edit System Announcement Sequence Diagram

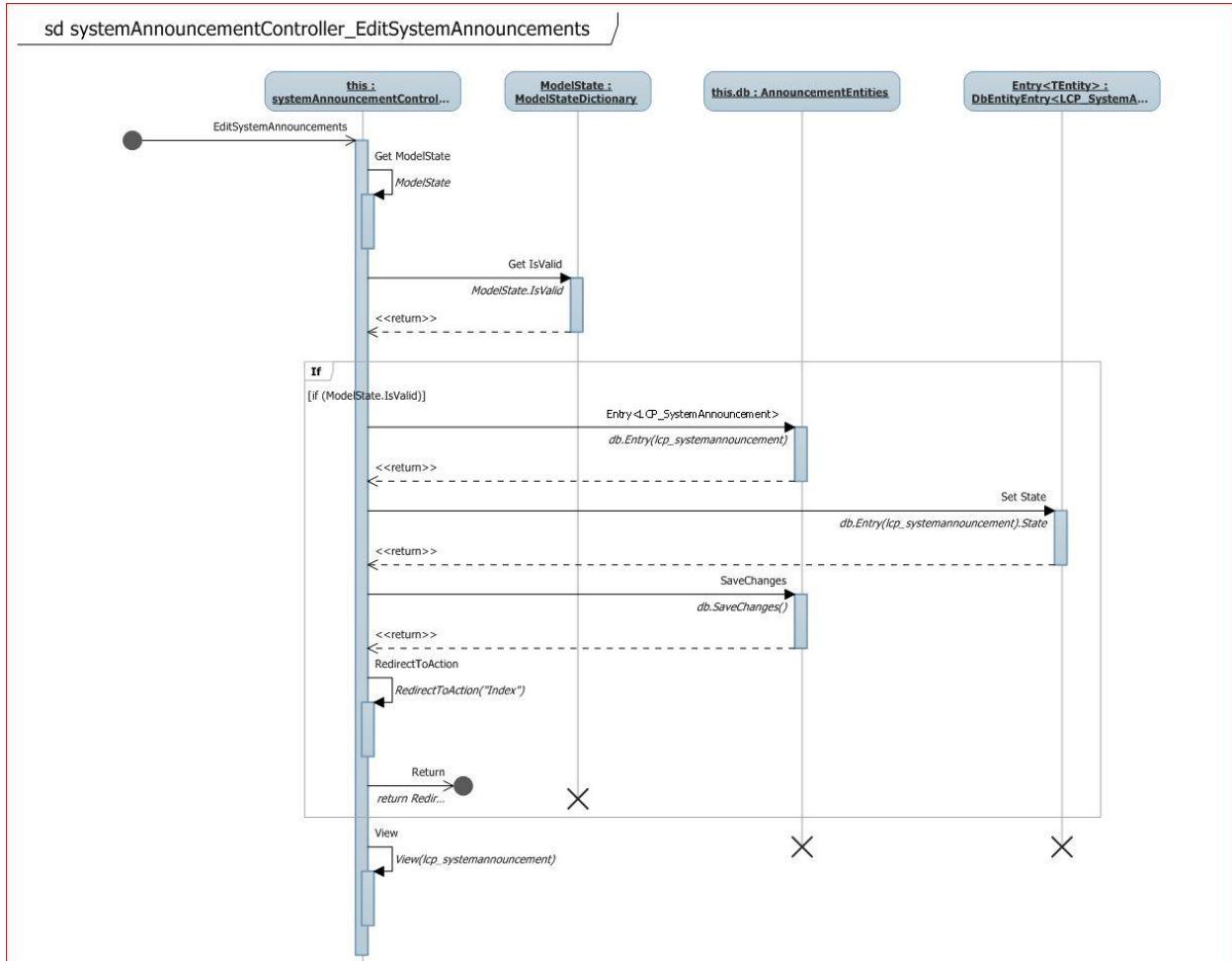


Figure 3-6 Edit System Announcements Sequence Diagram

3.2.1.4 Delete System Announcement Sequence Diagram

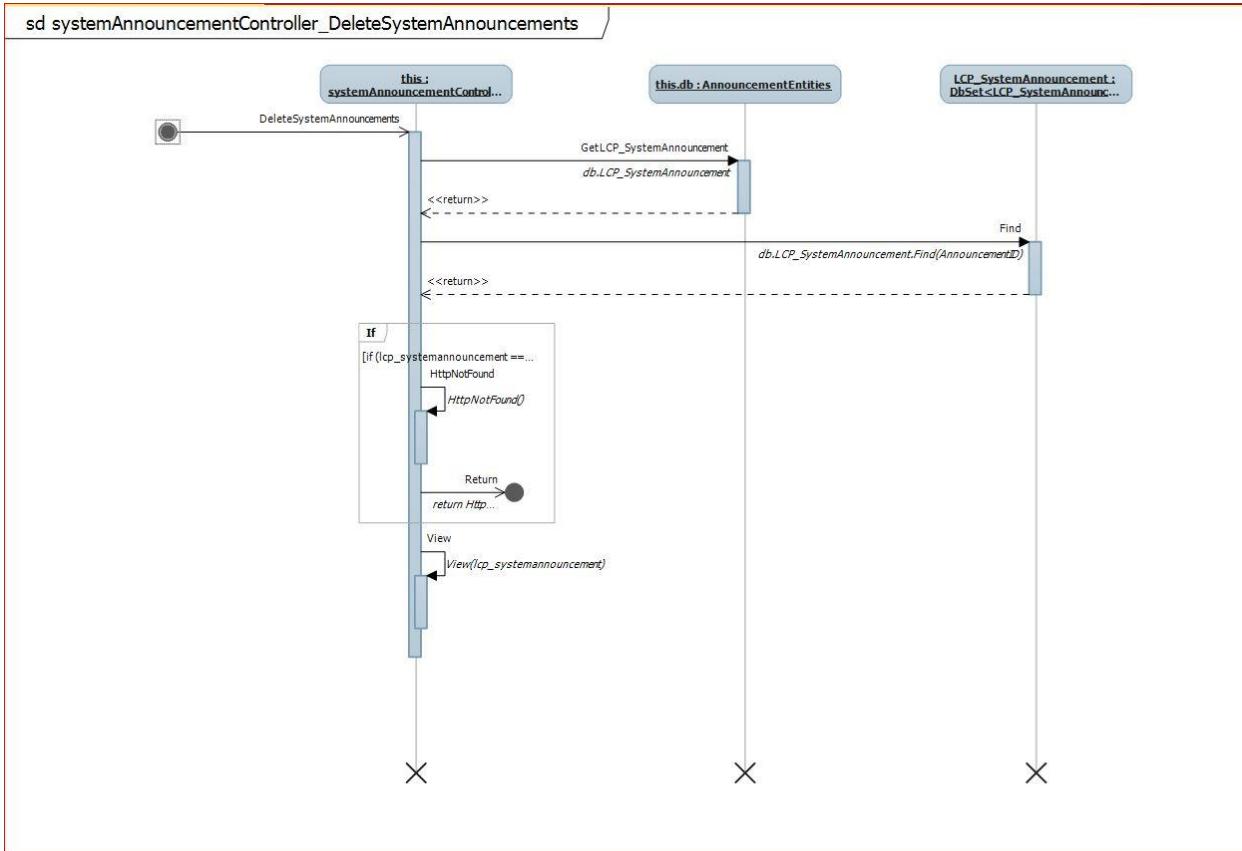


Figure 3-7 Delete System Announcements Sequence Diagram

3.2.1.5 Activate System Announcement Sequence Diagram

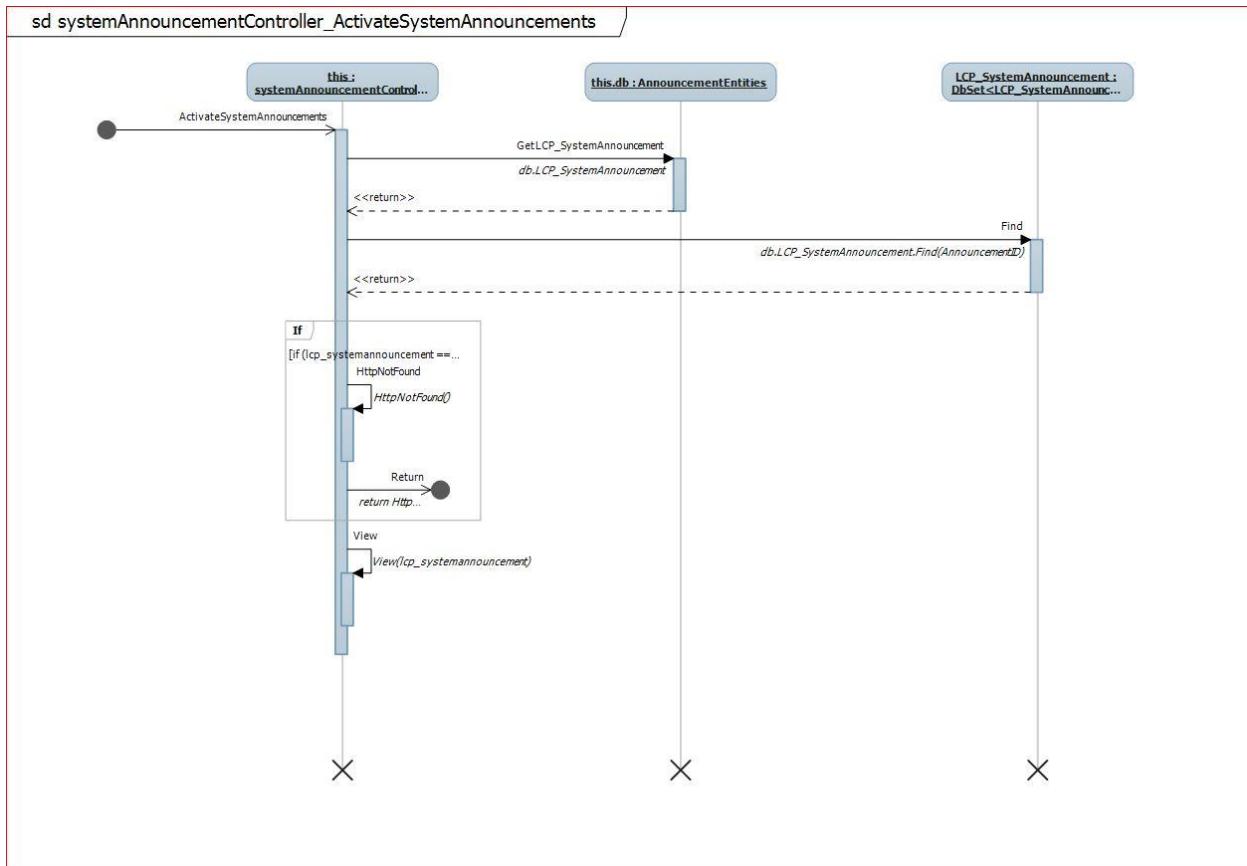


Figure 3-8 Activate System Announcements Sequence Diagram

3.2.1.6 Deactivate System Announcement Sequence Diagram

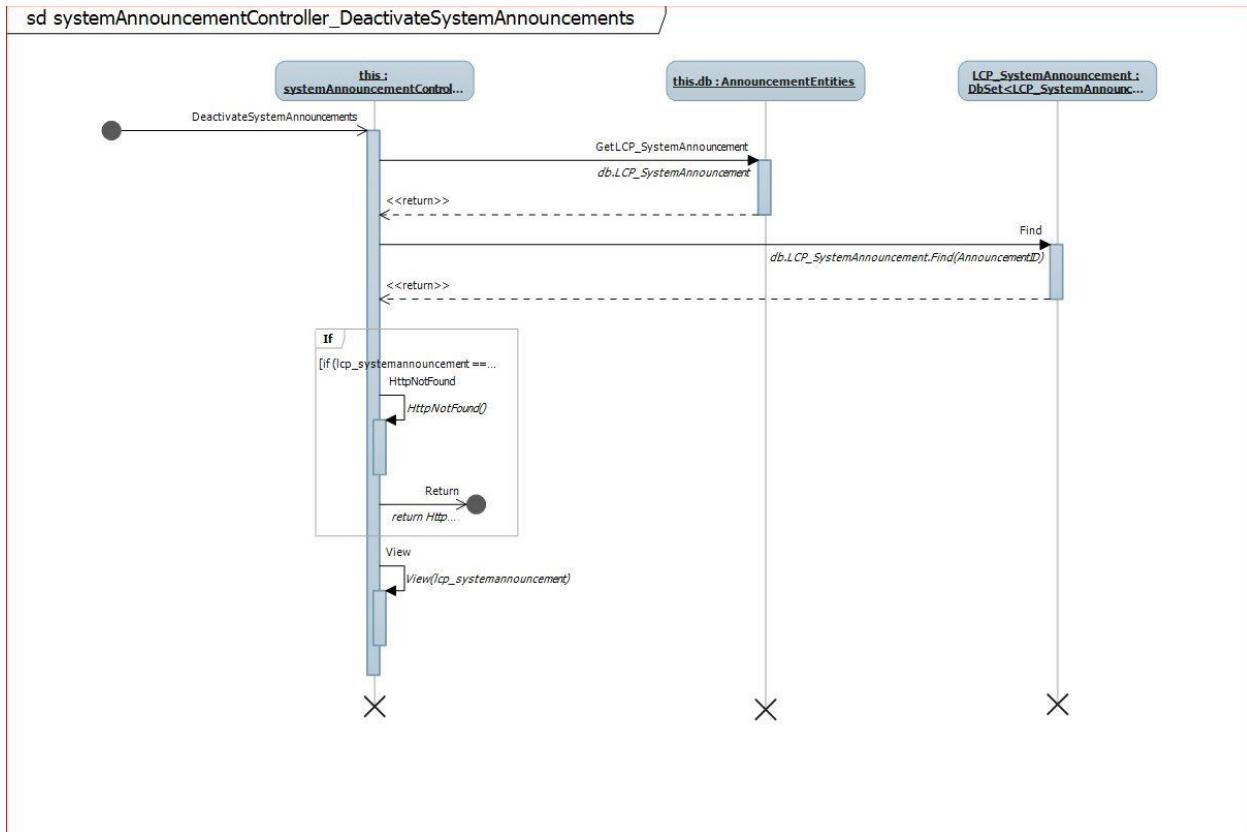


Figure 3-9 Deactivate System Announcements Sequence Diagram

3.2.1.7 Display System Announcement Sequence Diagram

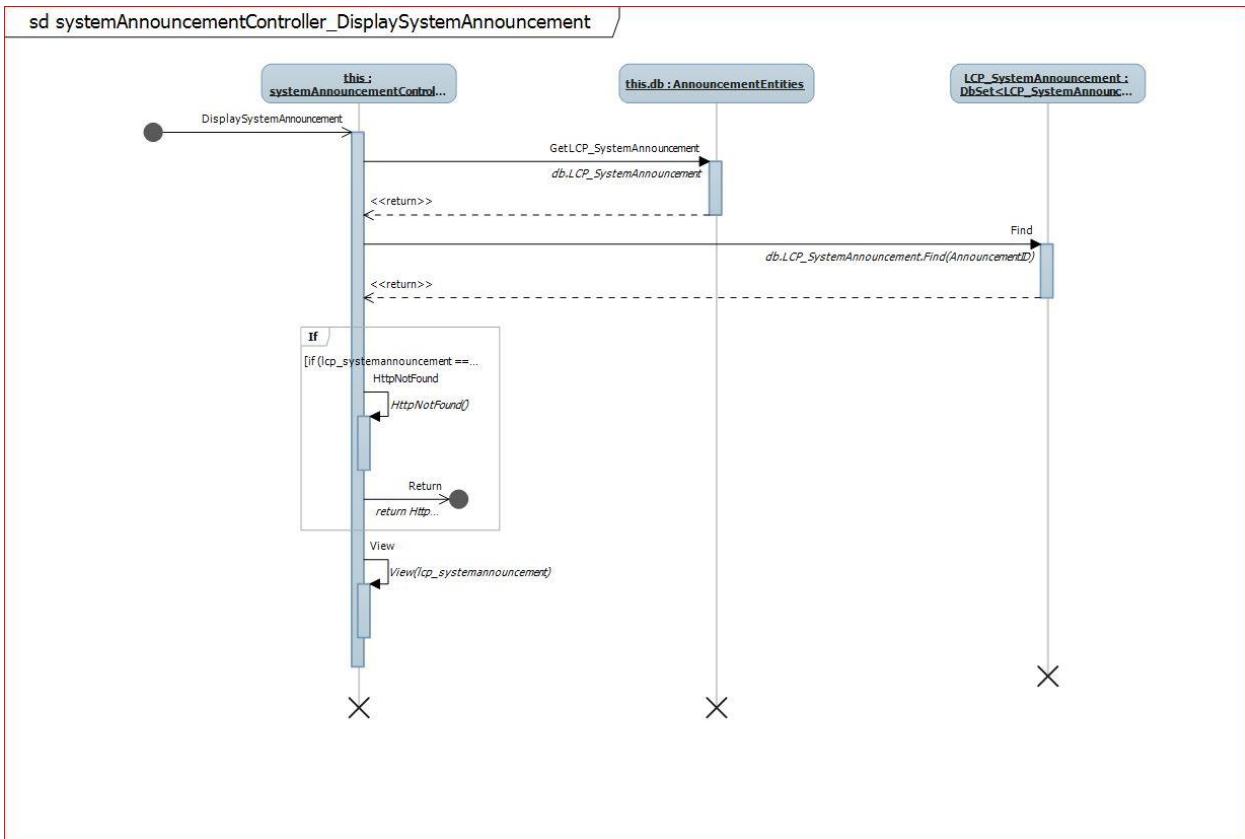


Figure 3-10 Display System Announcements Sequence Diagram

3.3 Summary Reports

The Summary Reports module will consist of a user interface that can be used to search and filter permits for the purpose of creating reports. The Summary Reports user interface will resemble the List Permits user interface but instead of providing a list of permits to view in a web browser it will provide a PDF report of all permits that match the search/filter criteria.

All reports that are generated using the Summary Reports search/filter interface will contain the same output columns. The header of each report will describe the data that is contained in the report.

The Summary Reports search filters will include the following:

- District: This will default to the user's primary district, and

- Permit State: All of the following permit states will be selected by default: Active, Approved, Queued, Pending, Deleted, Rejected, and Expired.

Archived permits will be included in the filters search by default. For each row in the table of permit results, the user will be able to access a menu with options to: view the details of a permit, copy a permit, delete a permit, or update the status of a permit.

3.3.1 Class Design

The Summary Reports module will use five primary classes:

- IPageHeaderProvider – an interface for providing a page header.
- BasePdfReportPage – Base class for generating PDF reports.
- FieldValueList – class that provides field values for the summary reports.
- PermitSummaryPdfReport – base class for permit summary reports.
- PermitSummaryReportController – controller class for routing permit summary actions.

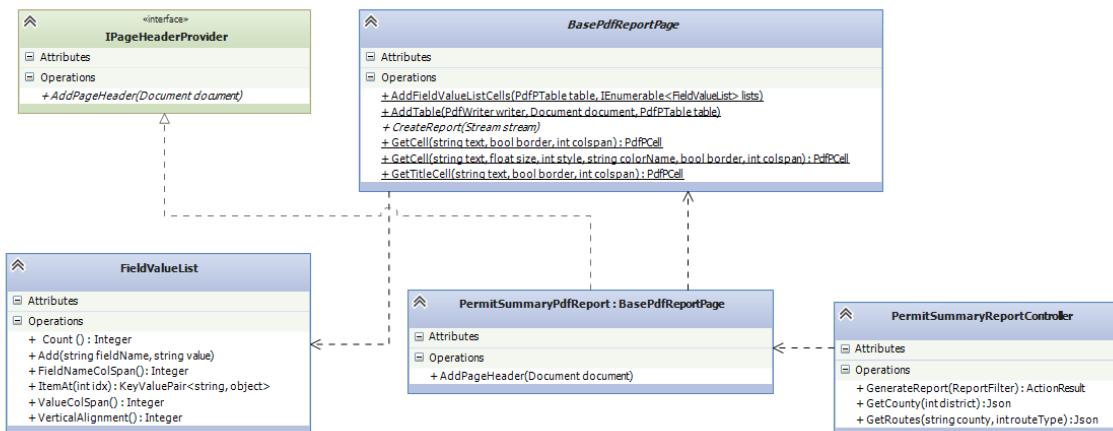


Figure 3-11 Summary Reports Class Diagram

3.3.2 Class Interaction

The sequence diagram below shows an example of how the objects in this module interact with each other. In general, the user will access the Summary Reports page using their web browser which makes a request to the controller object and displays the main page. Each filter used in the user interface will use AJAX calls to retrieve and populate user interface controls. When the user clicks the “Generate Report” button a request is made to the controller which then makes the necessary calls to fetch data and generate the Summary Report PDF file.

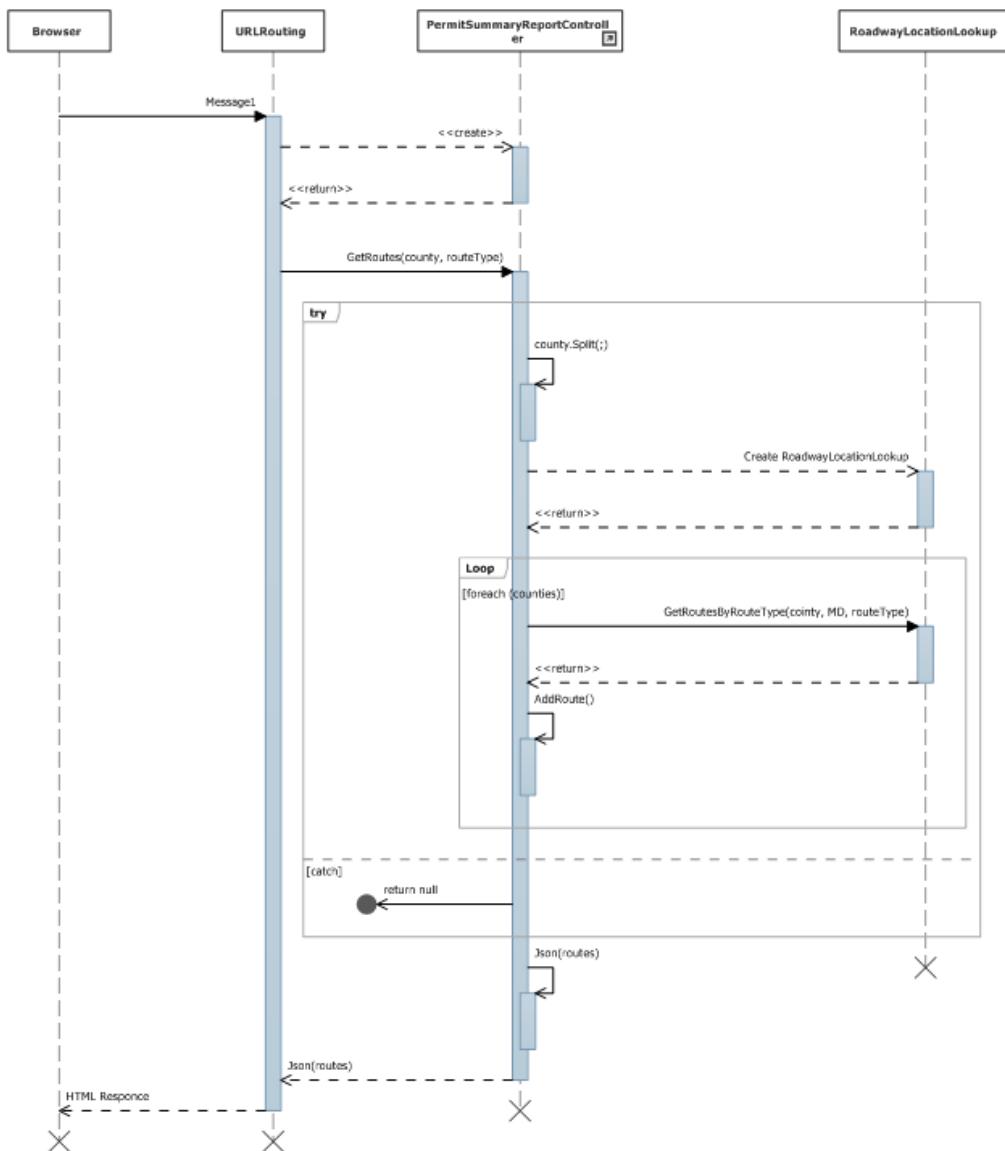


Figure 3-12 Summary Reports Sequence Diagram

3.3.1 User Interface

The user interface prototypes shown below display the design of the the output rendered by this module. The first image displays the Summary Reports screen in LCP that the user uses to select the desired parameters for the report to be generated. The second image displays the format and design of the PDF that is generated after the user selects the Generate Report button.

Summary Reports

District	District 2	County	Cecil County
Route Type	US	Route Number	40
Permit Type	Bridge		
By	<input type="radio"/> Date <input checked="" type="radio"/> Date Range	Start Date	08/07/2015
By	<input type="radio"/> Time <input checked="" type="radio"/> Time Range	Start Time	09:00
End Date	09/08/2015		
End Time	16:00		
<input checked="" type="checkbox"/> Active	<input type="checkbox"/> Approved		
<input type="checkbox"/> Include Archived Permits			
Summary	<input checked="" type="radio"/> Details	<input type="radio"/> Totals	
Generate Report		Reset	

Figure 3-13 Summary Reports parameters screen

Active Permits - District 1

Date: 8/26/2015

Print Date: 8/26/2015

Location	Dates	Times	Direction	Lanes	County	Tracking #	Permit Type	Reason
WICOMICO COUNTY: US-13 SOUTH FROM (US - 13) - S FRUITLAND BLVD (US - 13BU) TO (MU - 110) - S DIVISION ST (US - 13BU)	3-16-2015 to 8-28-2015	08:30 to 19:00	South	2/2 Southbound-both Shoulders, 2/2 Northbound-both Shoulders closed	Wicomico	D1-C-WI-2015-138	Construction	Intersection Improvements

Page 1 of 1 Generated On 8/26/2015 9:50:25 AM

Figure 3-14 Summary Reports PDF output

3.4 PR6838 Streamline contacts and permittees user interface

This update will implement user interface changes to the Create Permit wizard to provide a better user experience on the Permittee screen. The screen prototype below shows the new user interface design update. There are no server side objects required for this module.

The prototype interface for 'Lane Closure Permits' features a sidebar on the left with a vertical list of items numbered 1 through 9. Items 1, 2, 3, 4, 6, 7, 8, and 9 are in green boxes, while item 5 is in an orange box. The main area contains a table with columns for Last Name, First Name, Office, Phone, Cell phone, and Email. At the bottom are buttons for Add, Update, and Delete.

Last Name	First Name	Office	Phone	Cell phone	Email
Rubello	Chico	Midasco	443-677-8389	443-677-8389	Rubello@mdta.state.md.us
Monk	John	JFK II	410-537-8153	410-365-5882	@mdta.state.md.us
R	Sunil		443-677-8300	410-925-8387	R@mdta.state.md.us
Walter	Bruce	America Infrastr (301) 677-8111	443-250-5243		walter@mdta.state.md.us
Allison	Chris	FMT Maintenance	410-537-1270	443-829-3095	callison@mdta.state.md.us
Rex	Smith	F.S.K.	410-537-7672	443-829-1612	rsmith14@mdta.state.md.us
Sandoval	Elmer	Midasco, LLC	410-813-2284	571-259-6206	esandoval@midasco.net
BOWERS	MIKE	DISTRICT 3	443-324-8244	443-222-8777	@mdta.state.md.us
Young	Mike	Rommel Enginee	301 912-5740	443-506-0246	Young@mdta.state.md.us

Figure 3-15 PR6838 Streamline contacts and permittees user interface prototype

3.5 PR6845 Provide view only versions of list permits and permit reports

This update will provide a version of the List Permits page and permit details report that can be accessed by unauthenticated users of the LCP application. The design is identical to the existing modules that require authentication but will not provide the ability to perform any permit actions such as activate, deactivate, queue, etc.

3.5.1 Class Design

The view only version of the list permits module will use seven primary classes:

- ListPermitViewModel – used to provide a data model to the view.
- ListPermitViewModelCollection – used to hold collections of ListPermitViewModel objects.
- PermitsController – provides a controller for the MVC design pattern.
- PermissionUtils – provides permissions and restrictions for permit actions.
- ArchivedPermitsRepository – provides access to permits in the permit archive.
- IArchivedPermitsRepository – interface for implementing concrete ArchivedPermitsRepository.
- LCPArchiveEntities – provides specific entities from archived permits.

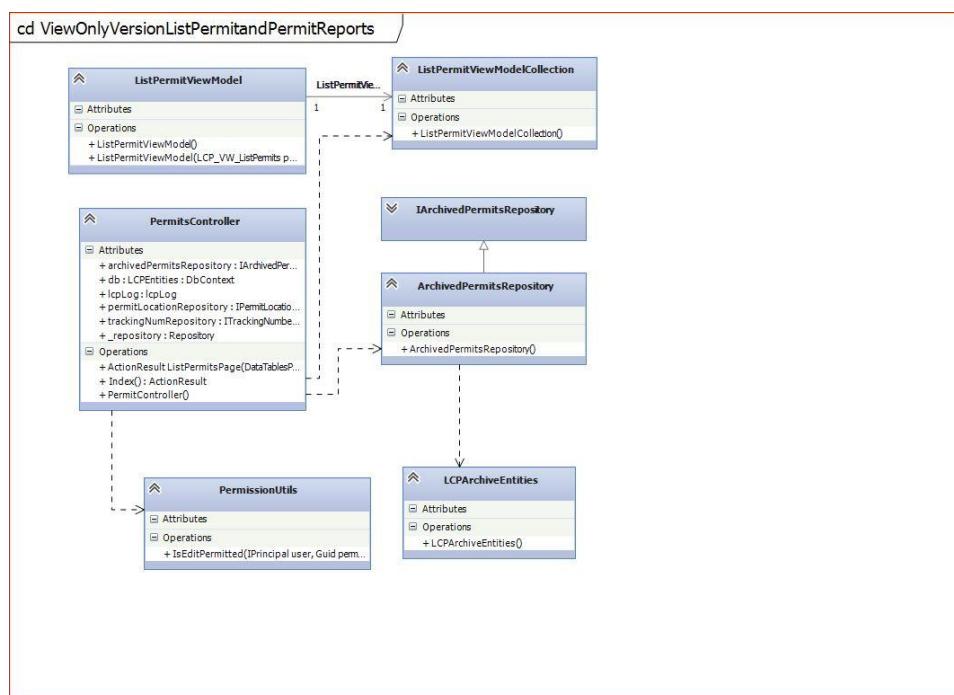


Figure 3-16 PR6845 Class Diagram

3.5.2 Class Interaction

The sequence diagram below shows an example of how the objects in this module interact with each other. In general, the user will access the module using the ListPermitView. The ListPermitView sends a request to the controller class which in turn get the permit data from the data store. The PermitUtils.IsEditPermitted method will ensure that unauthenticated users are unable to access and edit functionality for the permits. The list of permits is then sent back to the user interface and provided to the end user.

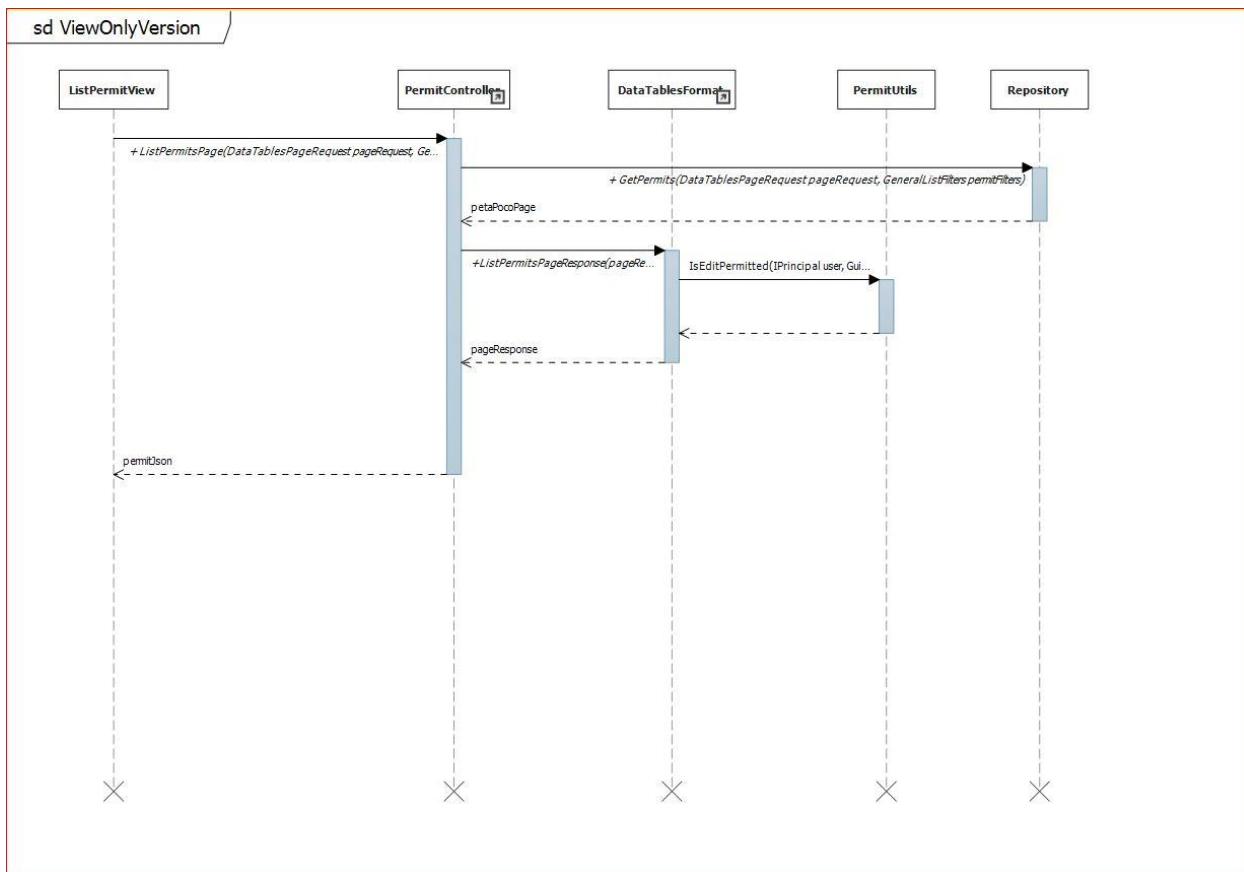


Figure 3-17 PR6845 Sequence Diagram

3.5.3 User Interface

The user interface prototype shown below displays the design of the the output rednedered by this module. Note that the user is not logged in but can still view the list of permits.

The screenshot shows a web-based application for managing lane closure permits. At the top, there is a navigation bar with links for 'Register' and 'Log in' (highlighted with a red box), 'Lane Closure Permits', and 'Help'. Below the navigation bar, there is a toolbar with icons for home, list permits, external links, and help. The main content area is titled 'List Permits' and features a green button labeled 'Show Filter Options'. Below this, there is a table header with columns: Active Permits, Queued Permits, Approved Permits (which is currently selected and highlighted in green), Pending Permits, Rejected Permits, Expired Permits, and Deleted Permits. The table is titled 'Approved Permits' and lists 10 entries. Each entry includes tracking numbers, dates, times, routes, locations, and an 'Options' button. The entries are as follows:

Tracking Number	Dates	Times	Route	Location	Options
D1-B-WI-2014-527	05/12/2014 - 09/30/2020	09:00 - 15:00	US 13	WICOMICO COUNTY: US-13 SOUTH/NORTH FROM (CO - 243) - JOHNSON RD (US - 13) TO (MD - 513) - ST LUKES RD (US - 13)	Options
D1-B-WI-2015-365	07/01/2015 - 07/31/2015	09:00 - 15:00	US 50	WICOMICO COUNTY: US-50 EAST/WEST AT POCOMOKE RIVER	Options
D1-B-WO-2015-366	07/01/2015 - 07/31/2015	09:00 - 15:00	US 13	WORCESTER COUNTY: US-13 SOUTH/NORTH AT POCOMOKE RIVER	Options
D1-B-WO-2015-367	07/01/2015 - 07/31/2015	09:00 - 15:00	MD 811	WORCESTER COUNTY: MD-811 SOUTH/NORTH AT SINEPUXENT BAY	Options
D1-B-WO-2015-368	07/01/2015 - 07/31/2015	09:00 - 15:00	MD 90	WORCESTER COUNTY: MD-90 EAST AT (MD - 346) - OLD OCEAN CITY BLVD (MD - 90)	Options
D1-C-SO-2015-40	02/02/2015 - 07/03/2015	07:00 - 17:00	MD 675	SOMERSET COUNTY: MD-675 SOUTH/NORTH FROM (US - 13) - OCEAN HWY (MD - 675) TO (MD - 822) - UMES BLVD (MD - 675)	Options
D1-C-WI-2015-136	03/16/2015 - 07/03/2015	06:30 - 19:00	US 13	WICOMICO COUNTY: US-13 SOUTH FROM (US - 13) - S FRUITLAND BLVD (US - 13BU) TO (MU - 110) - S DIVISION ST (US - 13BU)	Options
D1-C-WI-2015-187	04/01/2015 - 07/03/2015	07:30 - 15:00	US 50	WICOMICO COUNTY: US-50 EAST/WEST FROM (CO - 294) - WALSTON SWITCH RD (US - 50) TO (CO - 294) - WALSTON SWITCH RD (US - 50)	Options
D1-C-WI-2015-38	02/02/2015 - 07/03/2015	07:00 - 17:00	MD 349	WICOMICO COUNTY: MD-349 EAST/WEST FROM (CO - 95) - NANITOCKE DR (MD - 349) TO (CO - 109) - CROOKED OAK LA (MD - 349)	Options
D1-C-WI-2015-85	02/16/2015 - 07/03/2015	09:00 - 15:00	US 50	WICOMICO COUNTY: US-50 EAST/WEST FROM (CO - 294) - WALSTON SWITCH RD (US - 50) TO (CO - 294) - WALSTON SWITCH RD (US - 50)	Options

Figure 3-18 PR6845 View only versions of list permits user interface

3.6 PR7174 Provide members of Create role the ability to edit permits

Design for the updates required to implement this PR will include changes to the way the existing application manages permissions for permit edit activities. No user interface or database changes will be needed. The activity diagram for the design update describes the new flow that will be implemented with this PR update.

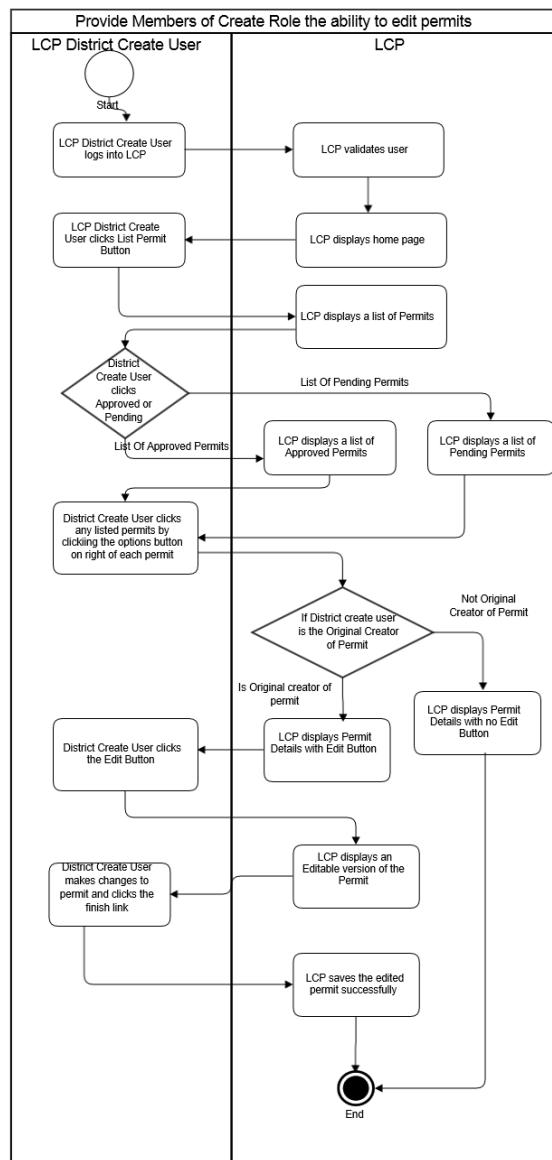


Figure 3-19 PR7174 Activity diagram

3.7 PR7356 LCP: Unmapped Approve Permit

The change for the PR7356 requires removing the "Unmap" button from the user interface. LCP users will no longer be able to unmap permits.

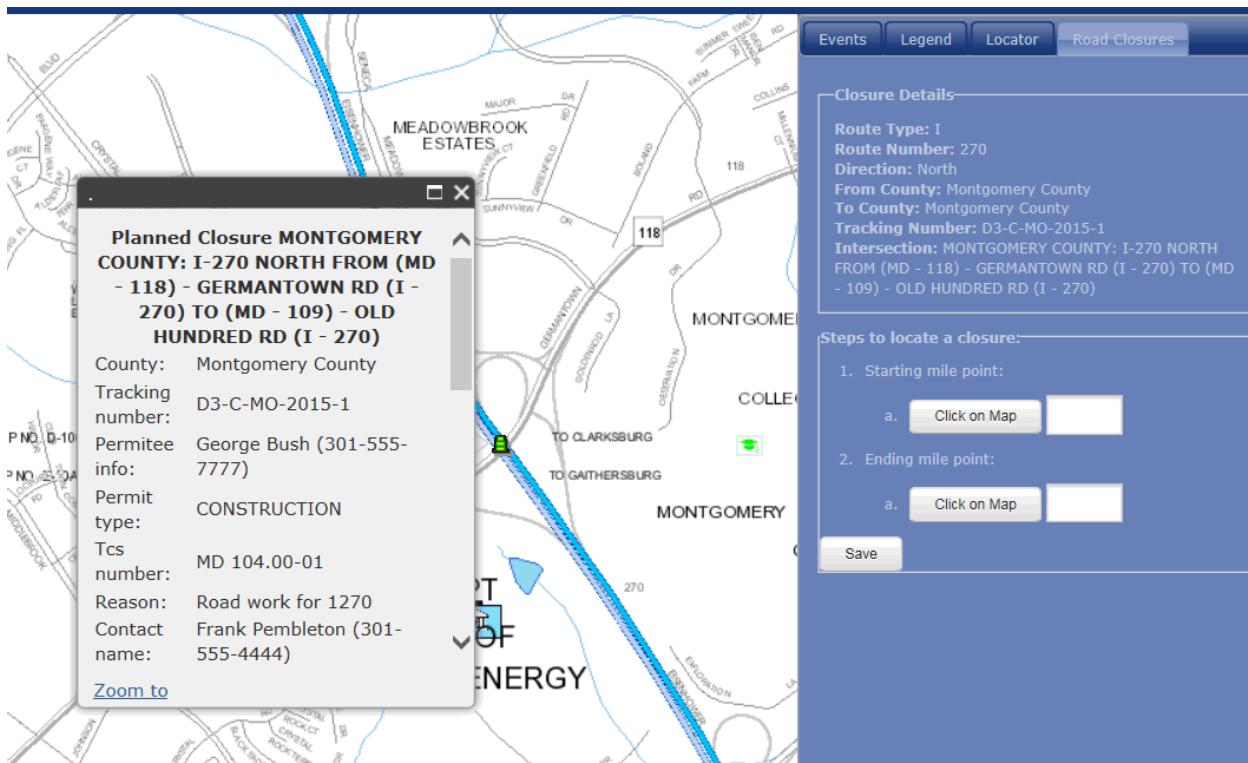


Figure 3-20 PR7356 User Interface Update

3.8 Assumptions and Constraints

3.8.1 LCP

1. Assumption: Internet Explorer 9, 10 and 11 will be the browsers used to access LCP Phase 4.

4 LCP Phase 4 Design Mapping To Requirements

Use Cases				
Use Case	Class Diagram	Sequence Diagram	Other	Document Reference
UC-1.1 List System Announcements	System Announcements - CD	System Announcements - List System Announcements - SqD		Section 3.2
UC-1.2 Create New System Announcement	System Announcements - CD	System Announcements - Create New System Announcement - SqD		Section 3.2
UC-1.3 Edit System Announcements	System Announcements - CD	System Announcements - Edit System Announcements - SqD		Section 3.2
UC-1.4 Delete System Announcements	System Announcements - CD	System Announcements - Delete System Announcements - SqD		Section 3.2
UC-1.5 Activate System Announcements	System Announcements - CD	System Announcements - Activate System Announcements - SqD		Section 3.2

UC-1.6 Deactivate System Announcement	System Announcements - CD	System Announcements - Deactivate System Announcements - SqD		Section 3.2
UC-1.7 Display System Announcement	System Announcements - CD	System Announcements - Display System Announcement - SqD		Section 3.2
UC-2.1 Updates to LCP History Logs	Updates to LCP History Logs - CD	Updates to LCP History Logs - SqD		
UC-3.1 Summary Reports	Summary Reports - CD	Summary Reports Sequence Diagrams 1-6		Section 3.3
UC-3.2 Summary Report - Permits by Route by Date	Summary Reports - CD	Summary Reports Sequence Diagrams 1-6		Section 3.3
UC-3.3 Summary Reports - Permits by County by Day	Summary Reports - CD	Summary Reports Sequence Diagrams 1-6		Section 3.3
UC-3.4 Summary Reports - Permits by Route by Date	Summary Reports - CD	Summary Reports Sequence Diagrams 1-6		Section 3.3
UC-3.5 Summary Reports - Permits by County by Day	Summary Reports - CD	Summary Reports Sequence Diagrams 1-6		Section 3.3

UC-3.6 Summary Reports - Permits by Type by County by Date Range	Summary Reports - CD	Summary Reports Sequence Diagrams 1-6		Section 3.3
UC-4.1 PR6838 LCP: Streamline contacts and permittees user interface	N/A	N/A	PR6838 User Interface Prototype.	Section 3.4
UC-4.7 PR 6841 Add ability to edit remarks	PR6841 Class Diagram	PR6841 Sequence Diagram		Section 4.1.2
UC-4.2 PR6845 Provide view only versions of list permits and permit reports	PR6845 Provide view only versions of list permits and permit reports - CD	PR6845 Provide view only versions of list permits and permit reports - SqD		Section 3.5
UC-4.8 PR 7094 - Add submit button to DAPT for better user experience	PR7094 Class Diagram	PR7094 Sequence Diagram		Section 4.1.4
NFR-4.9 PR 7107 Users should not be able to delete approved permits	PR7174 Class Diagram	PR7107 Sequence Diagram 1-2		Section 4.1.5

UC-4.5 PR7174 LCP: Provide members of Create role the ability to edit permits	PR7107 Class Diagram	PR7174 Sequence Diagram 1-2		Section 4.1.6
PR7356: LCP: Unmapped Approve Permit	N/A	N/A	PR7356 User Interface Prototype	Section 3.7
Nonfunctional Requirements				
NFR		Design Element Reference		
NFR- 1 PR7032 LCP: Add report to provide a total count on how many Lane Closure permits were entered for date range		To be added to the bottom of existing reports.		
NFR-2 PR7104 LCP: Details pages for some permits are slow to load when their permit histories contain a lot of entries.		Update module to use AJAX calls to load permit histories on demand.		
NFR -3 PR7221 LCP: Investigate adding the ability to change usernames so they match MDOT login names		Config change. See “MDOT Naming Standards for Managed Network Infrastructure Devices” Section 3 for standards.	Configuration change.	

4.1 Additional UML Diagrams

4.1.1 System Announcements

4.1.1.1 Class Diagram

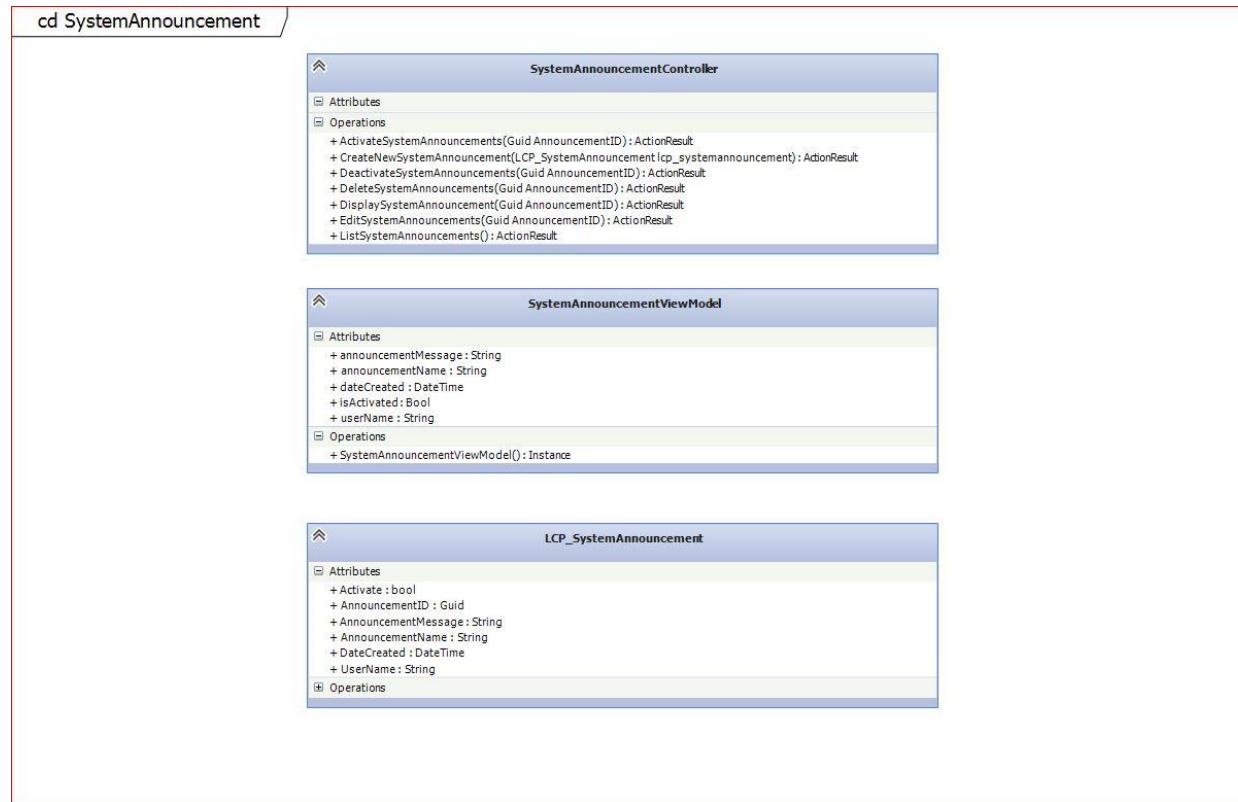


Figure 4-1 System Announcements Class Diagram

4.1.1.2 Class Diagram

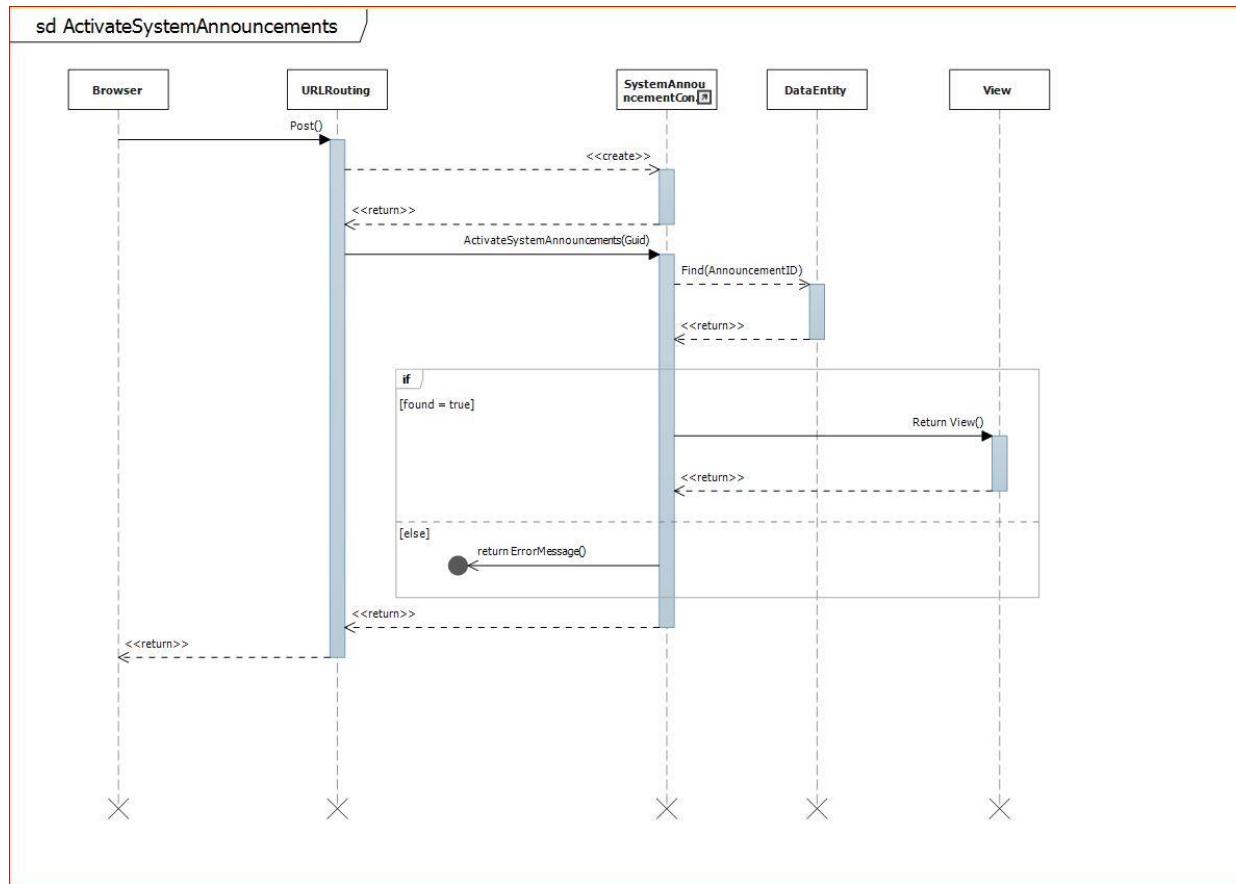


Figure 4-2 System Announcements Sequence Diagram 1

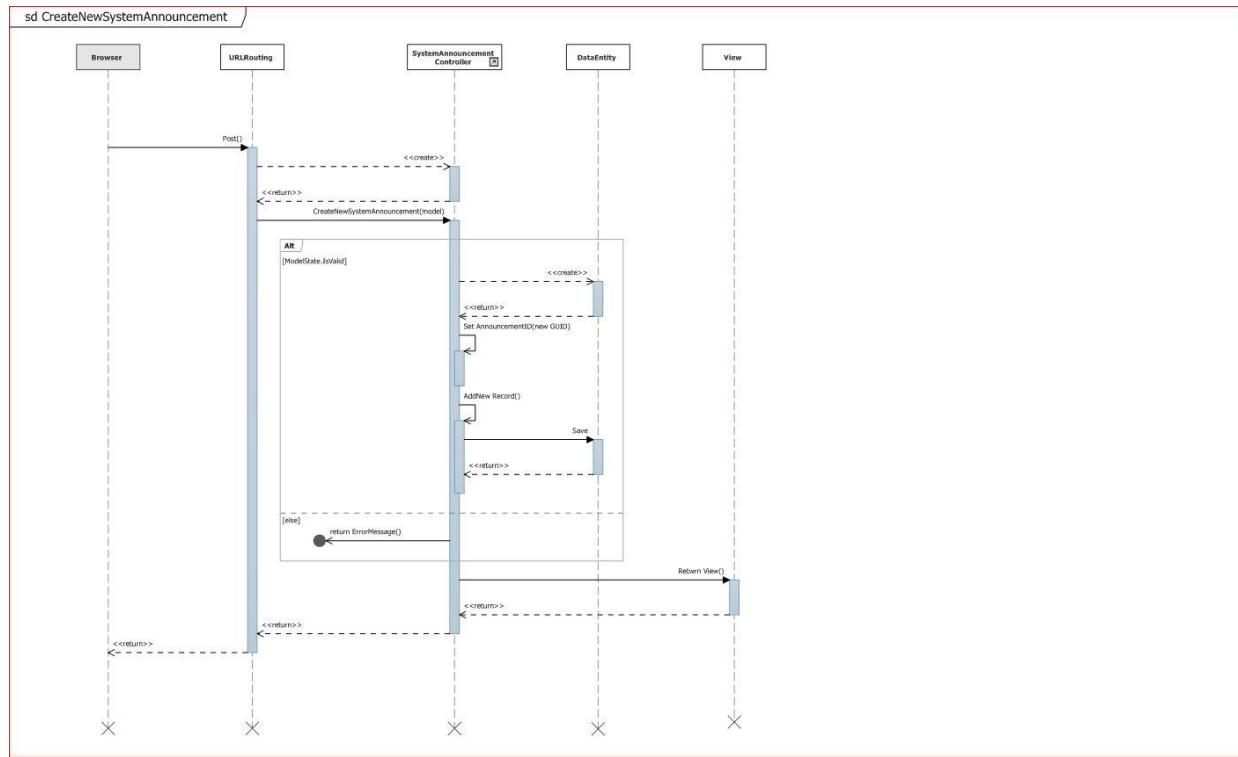


Figure 4-3 System Announcements Sequence Diagram 2

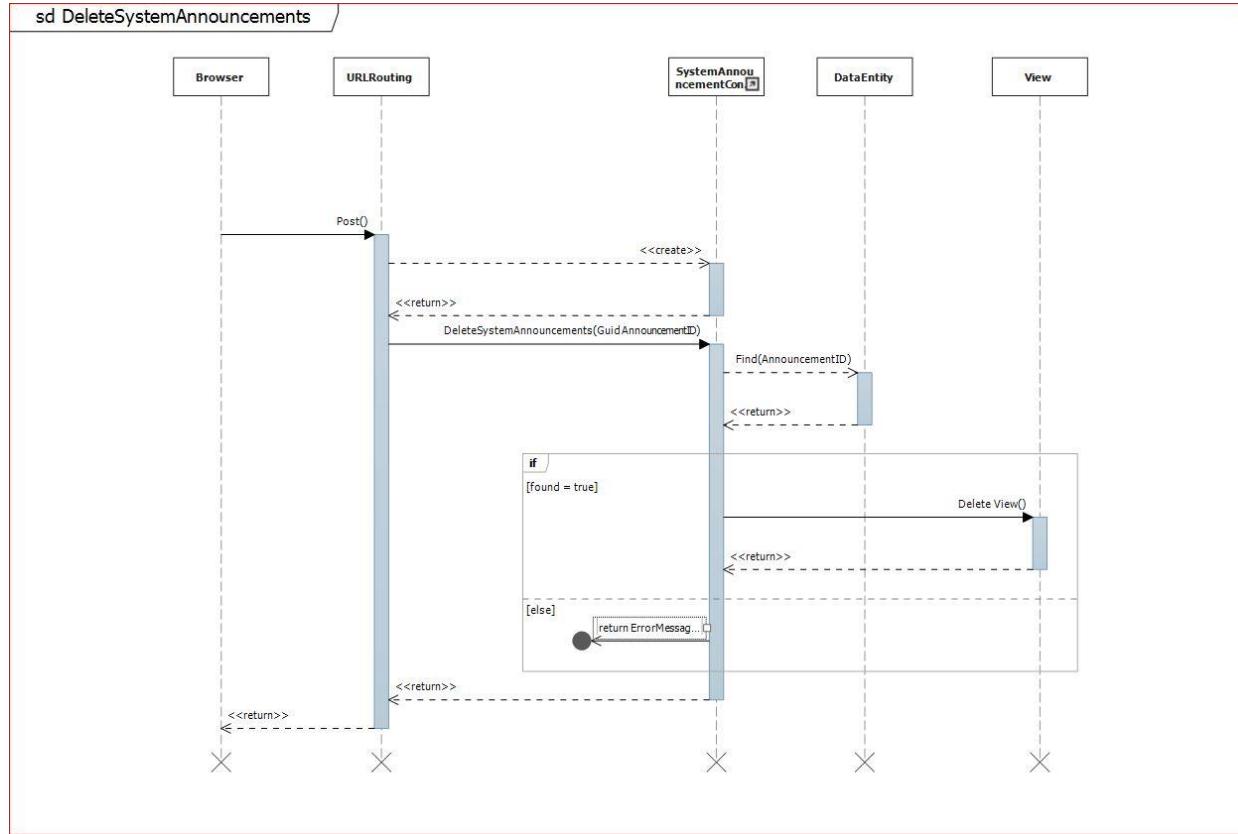


Figure 4-4 System Announcements Sequence Diagram 3

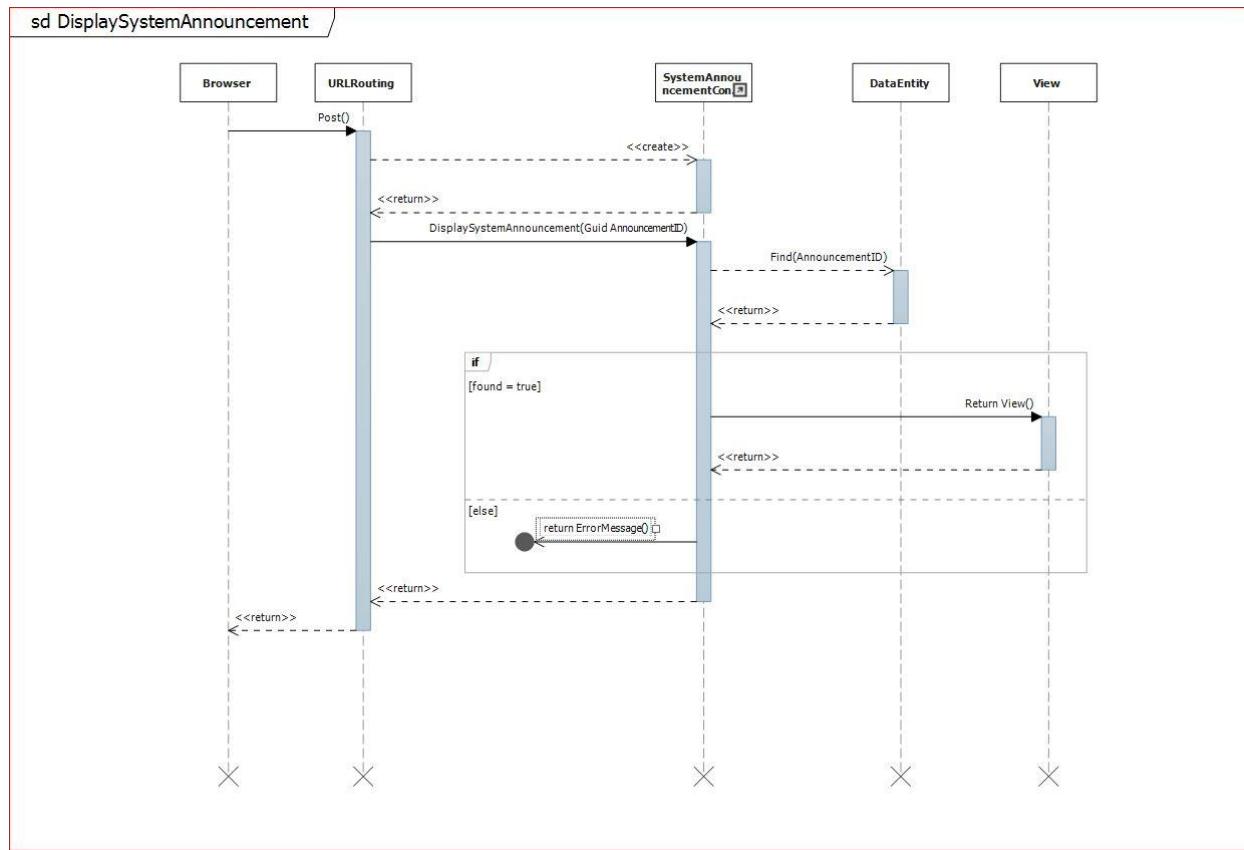


Figure 4-5 System Announcements Sequence Diagram 4

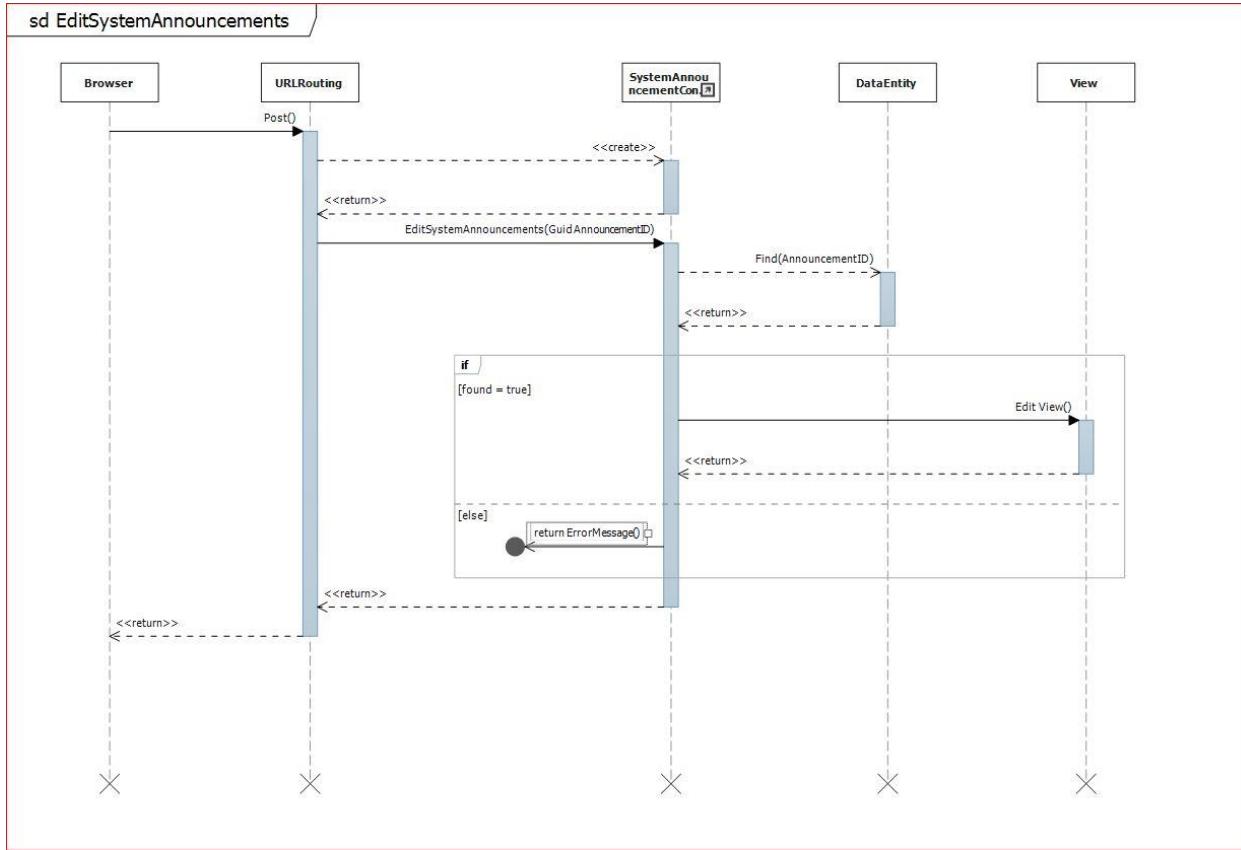


Figure 4-6 System Announcements Sequence Diagram 5

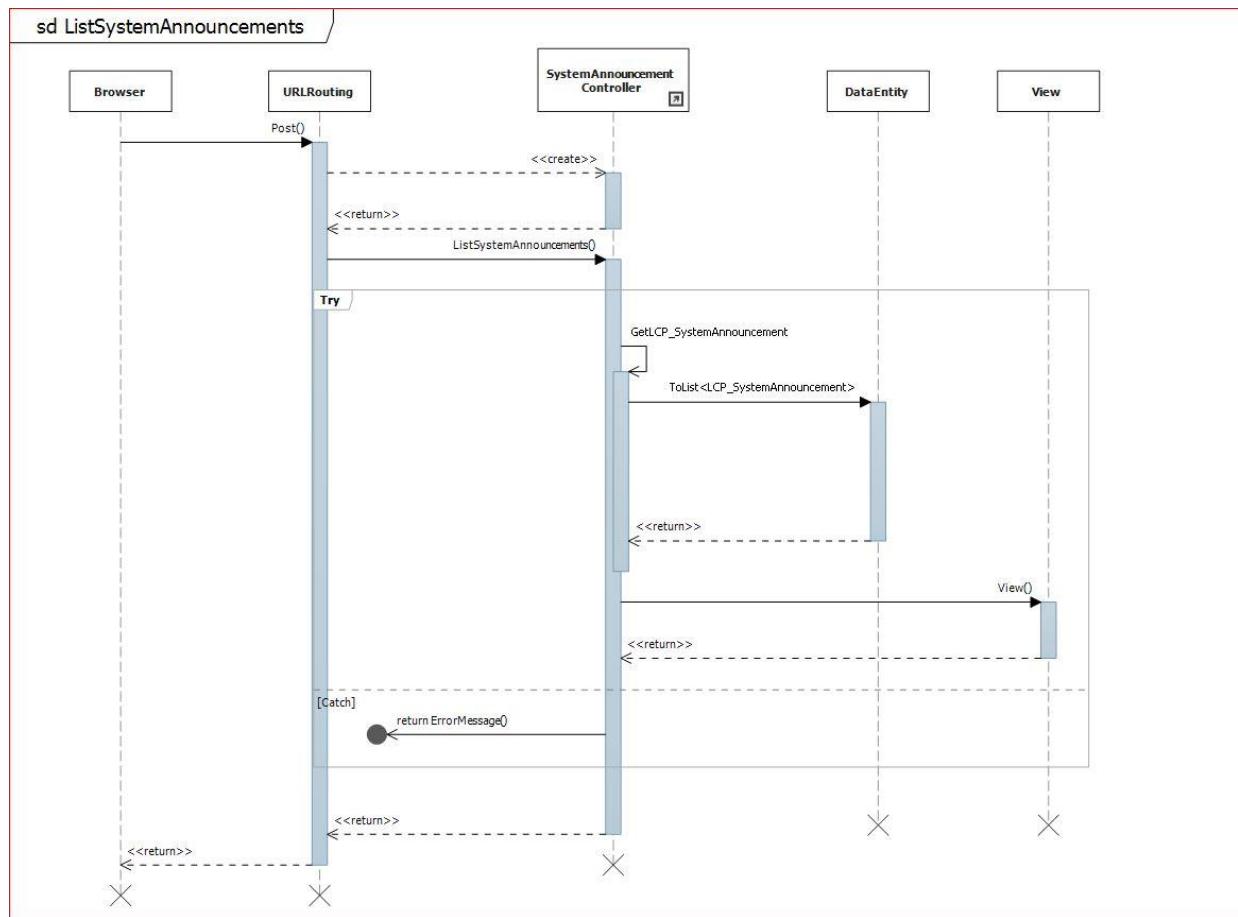


Figure 4-7 System Announcements Sequence Diagram 6

4.1.2 Summary Reports

4.1.2.1 Class Diagram

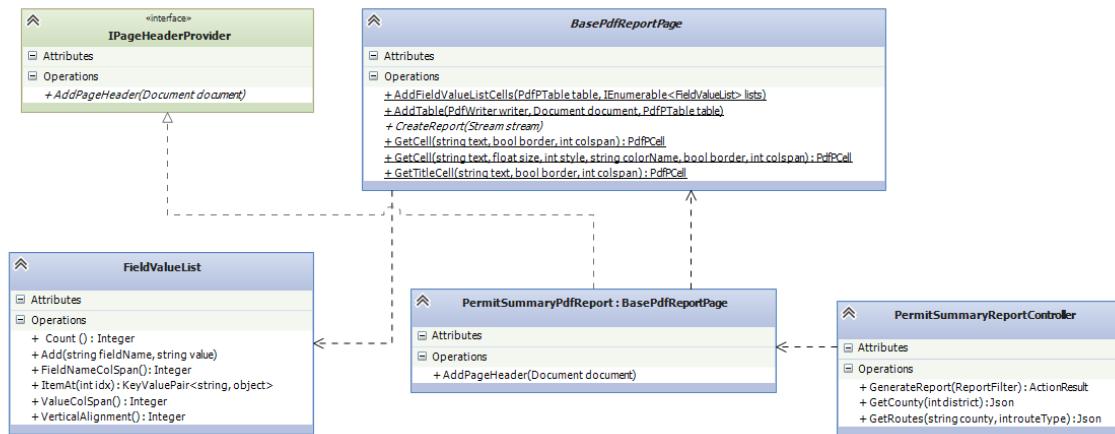


Figure 4-8 Summary Reports Class Diagram

4.1.2.2 Sequence Diagrams

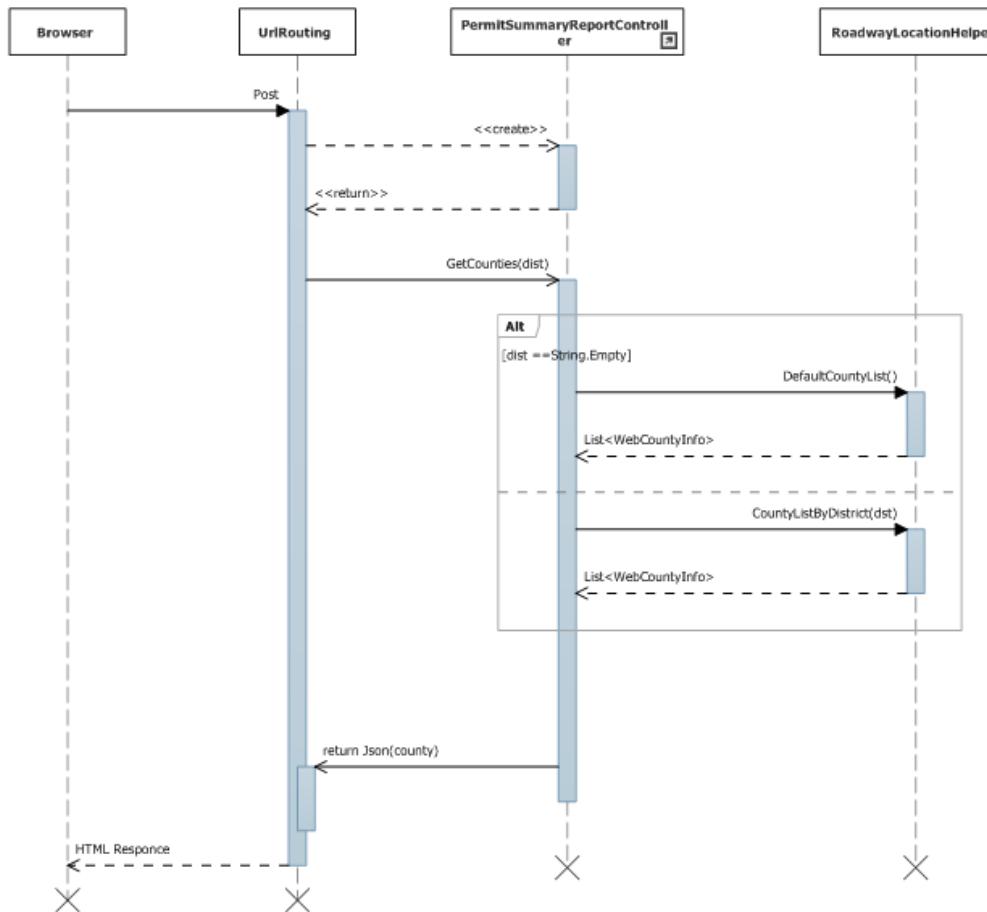


Figure 4-9 Summary Reports Sequence Diagram 1

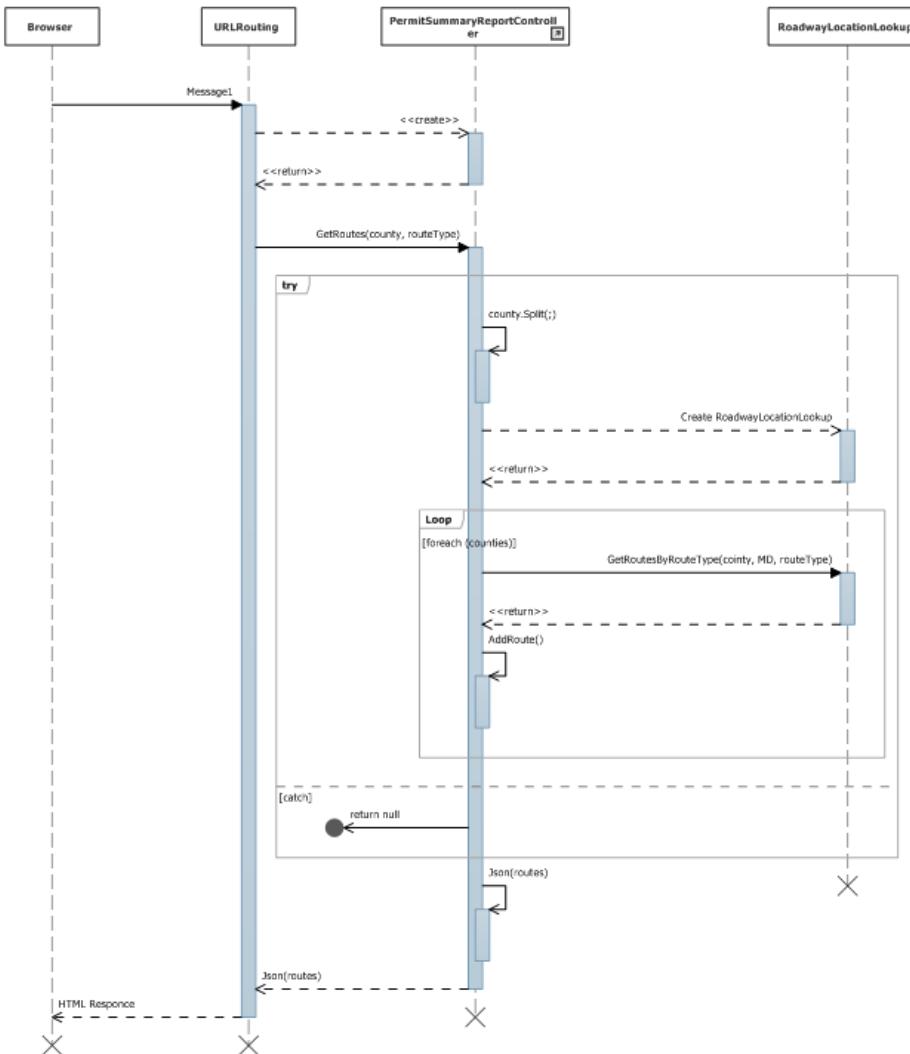


Figure 4-10 Summary Reports Sequence Diagram 2

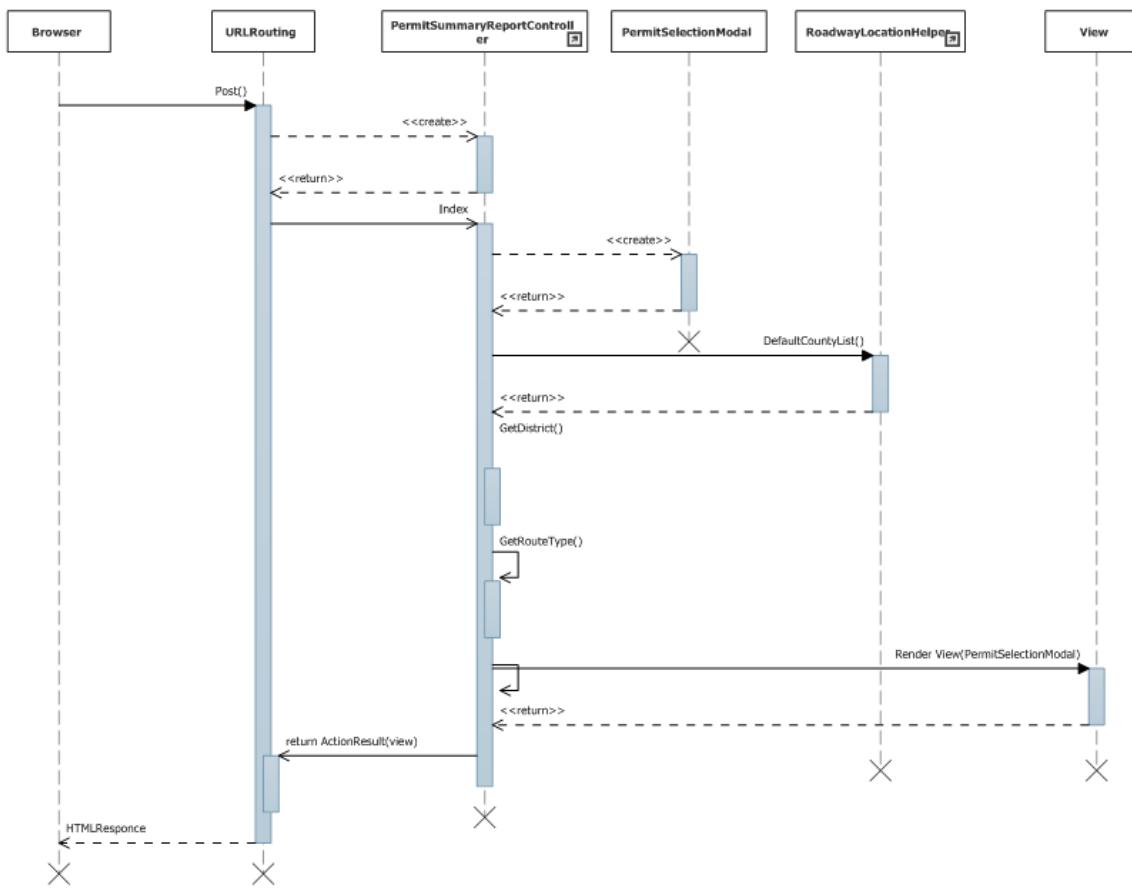


Figure 4-11 Summary Reports Sequence Diagram 3

4.1.1 Updates to LCP History Logs

4.1.1.1 Class Diagram

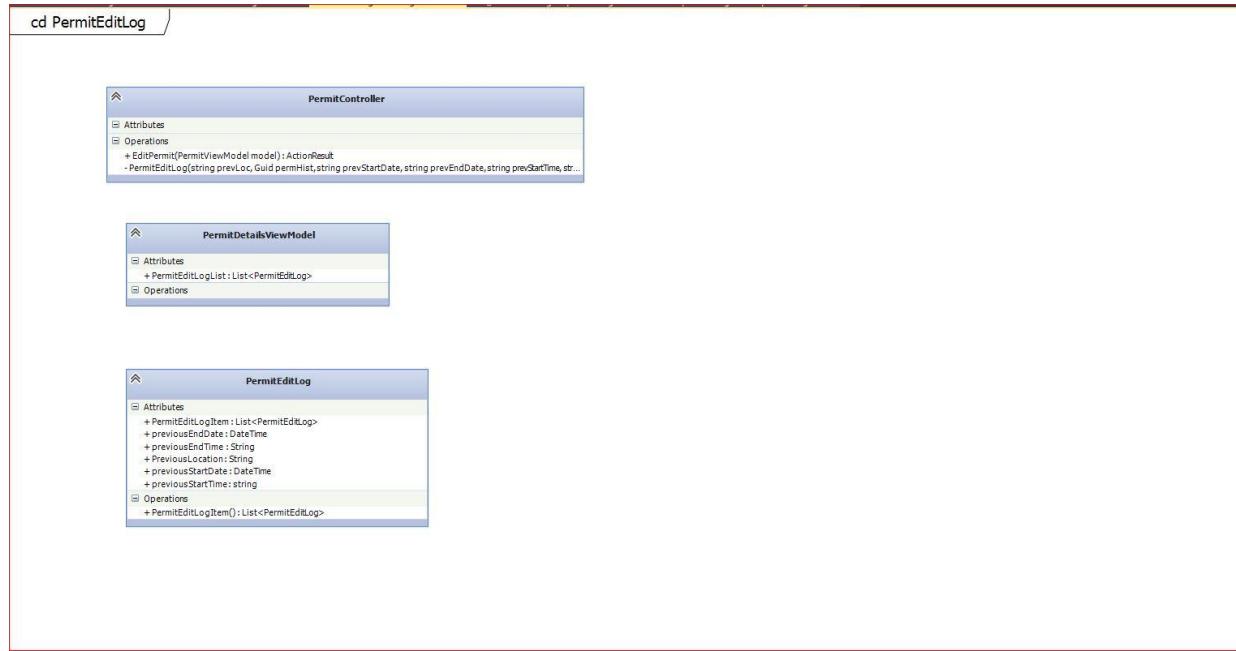


Figure 4-12 Updates to LCP History Logs Class Diagram

4.1.1.2 Sequence Diagram

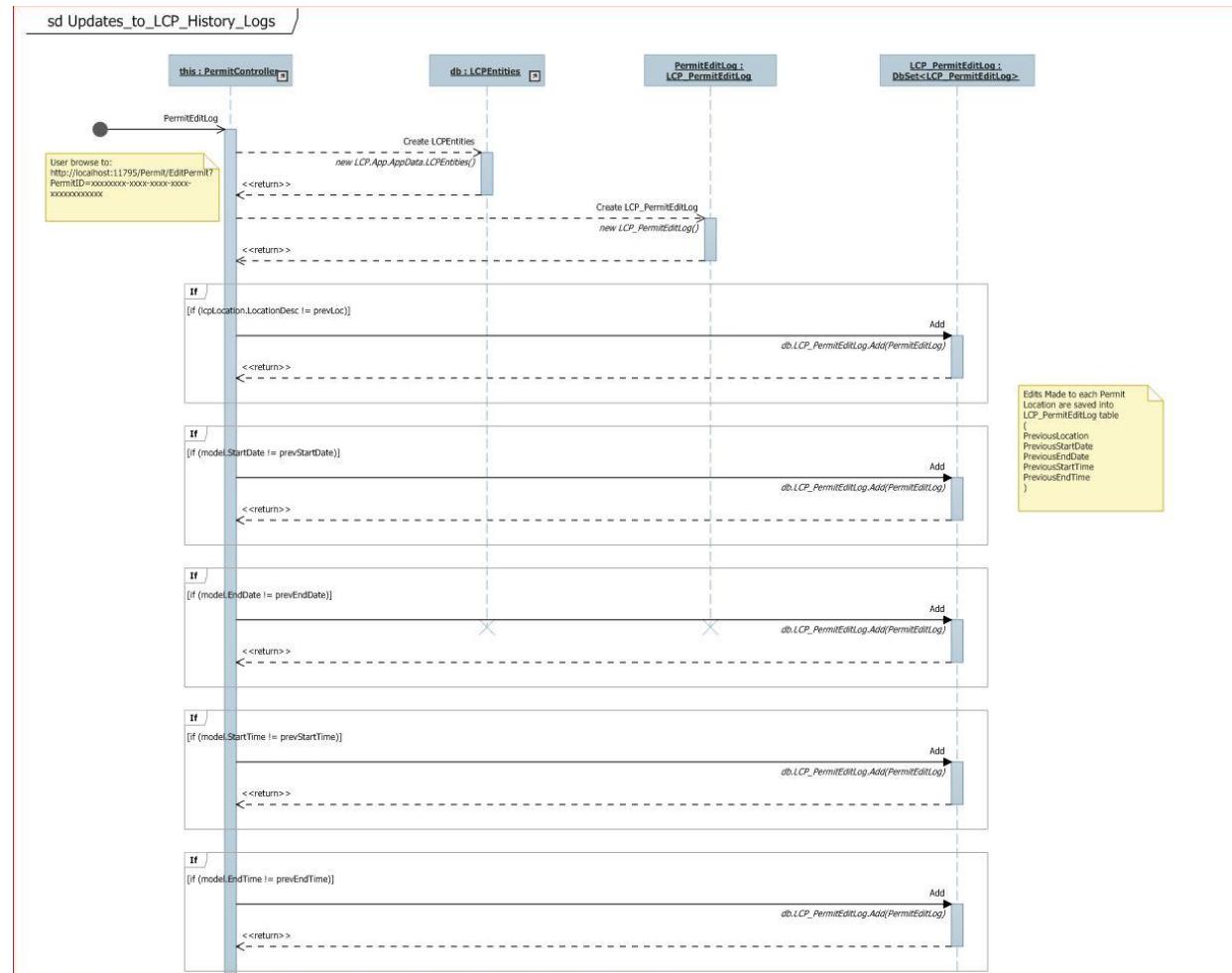


Figure 4-13 Updates to LCP History Logs Sequence Diagram

4.1.2 PR6841

4.1.2.1 Class Diagram

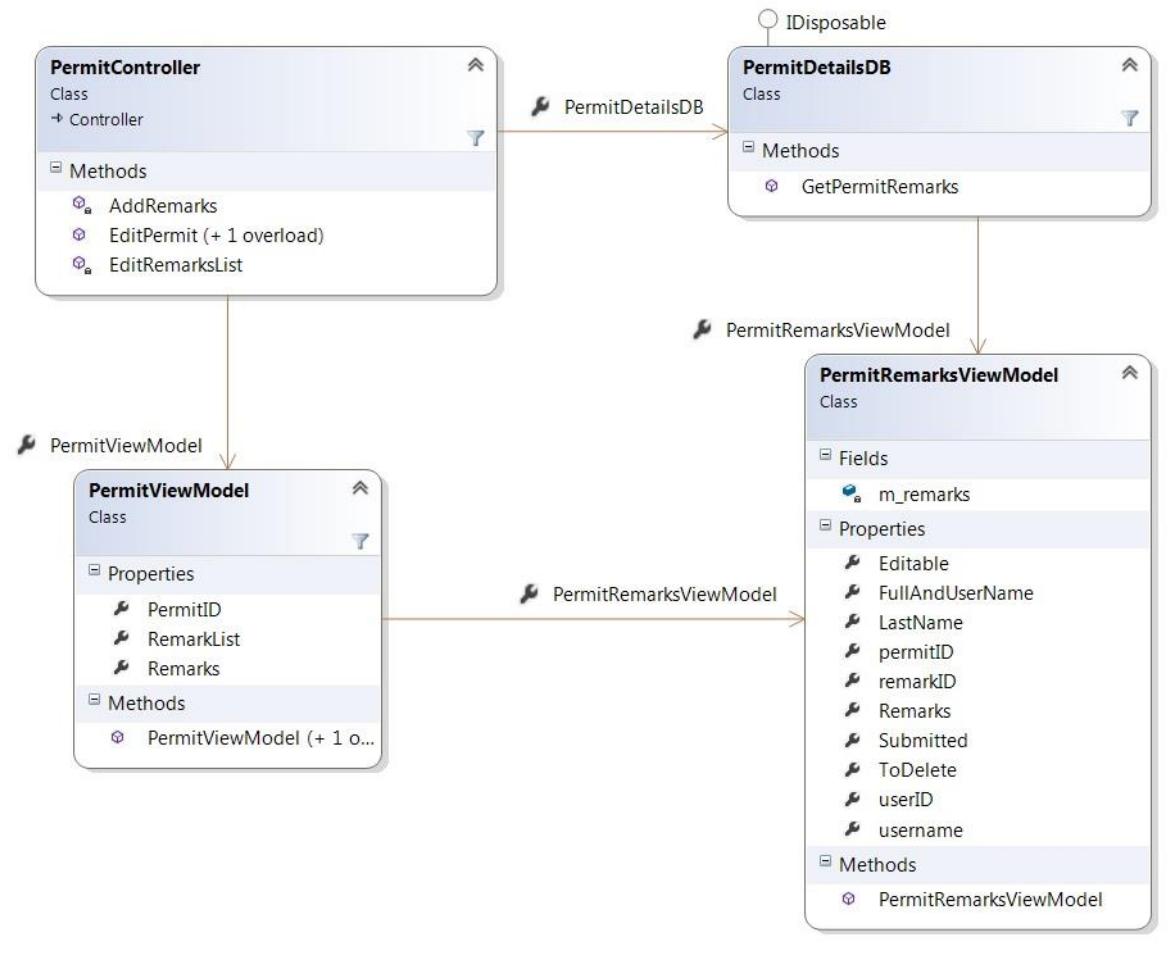


Figure 4-14 PR6841 Class Diagram

4.1.2.2 Sequence Diagram

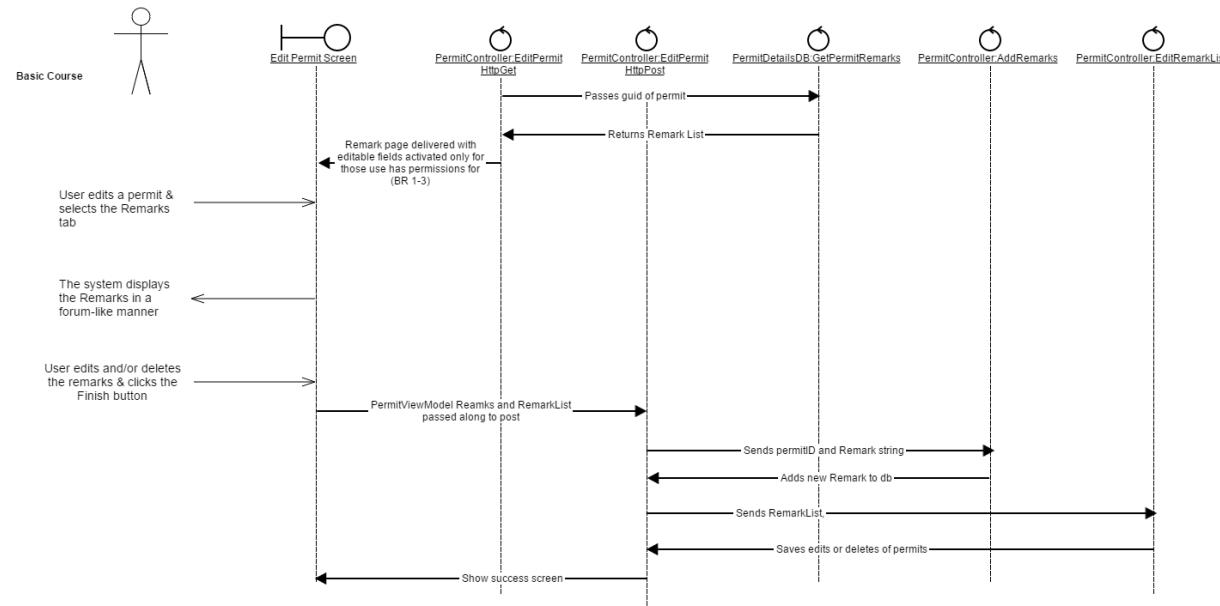


Figure 4-15 PR6841 Sequence Diagram

4.1.3 PR6845

4.1.3.1 Class Diagram

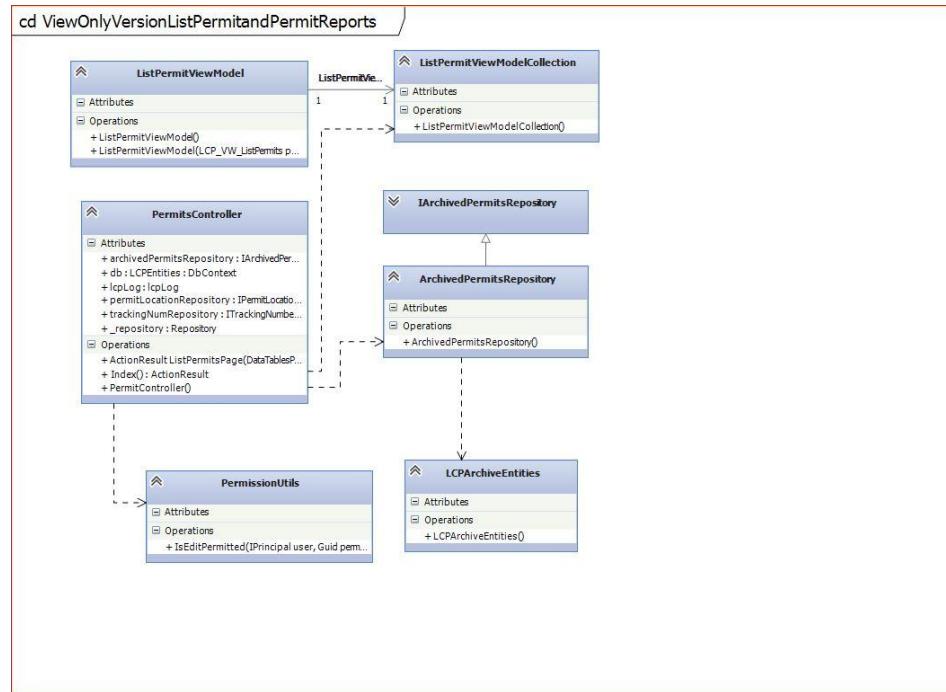


Figure 4-16 PR6845 Class Diagram

4.1.3.2 Sequence Diagram

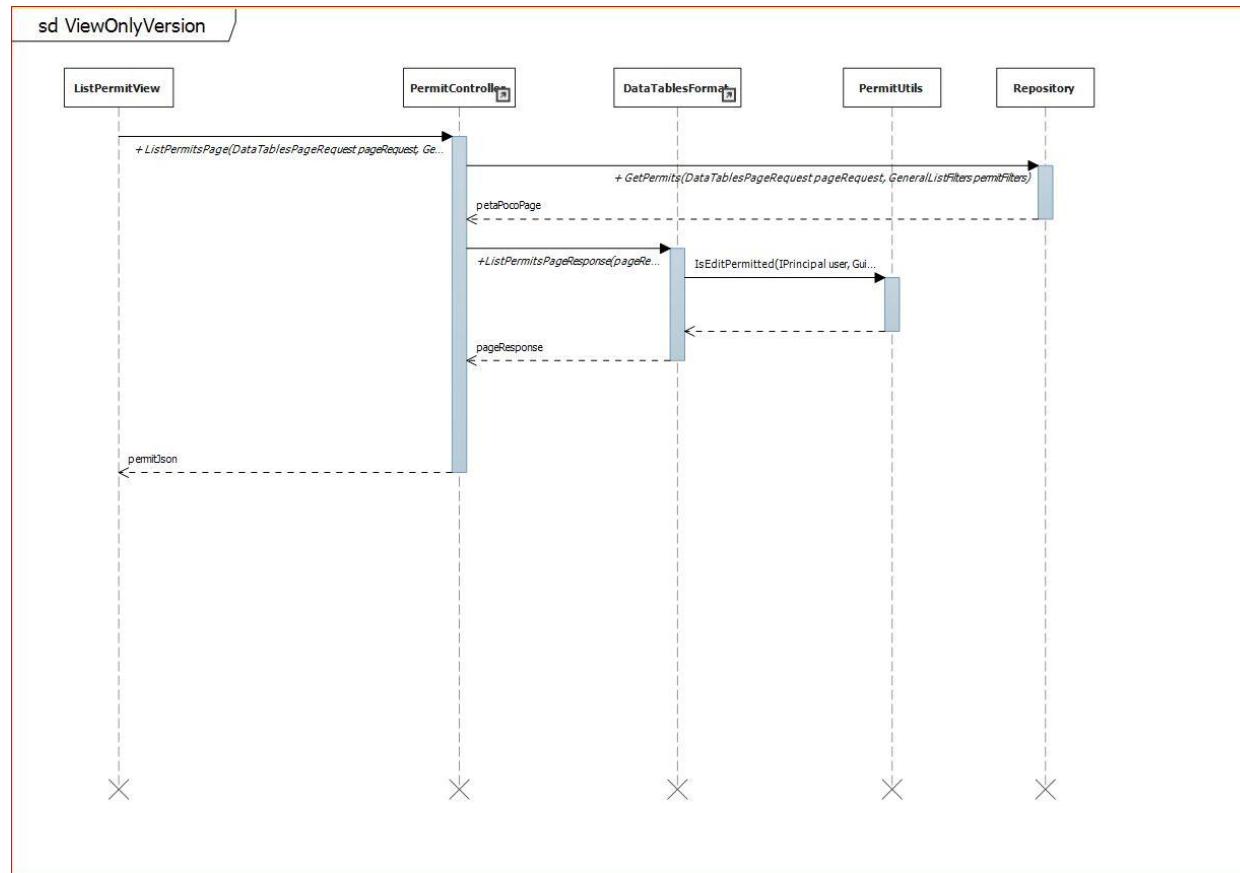


Figure 4-17 PR6845 Sequence Diagram

4.1.4 PR7094

4.1.4.1 Class Diagram

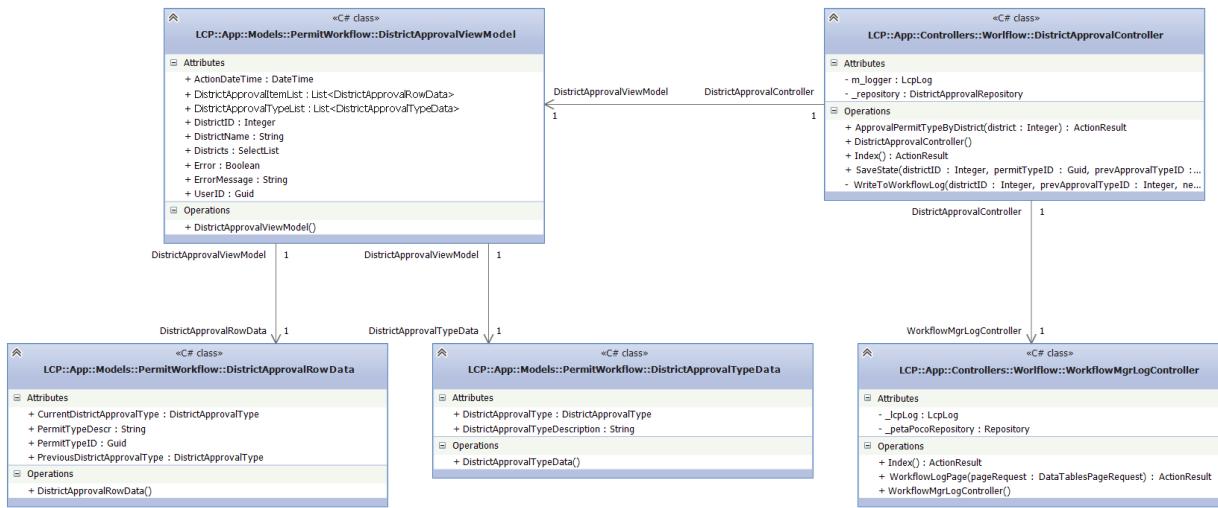


Figure 4-18 PR7094 Class Diagram

4.1.4.2 Sequence Diagram

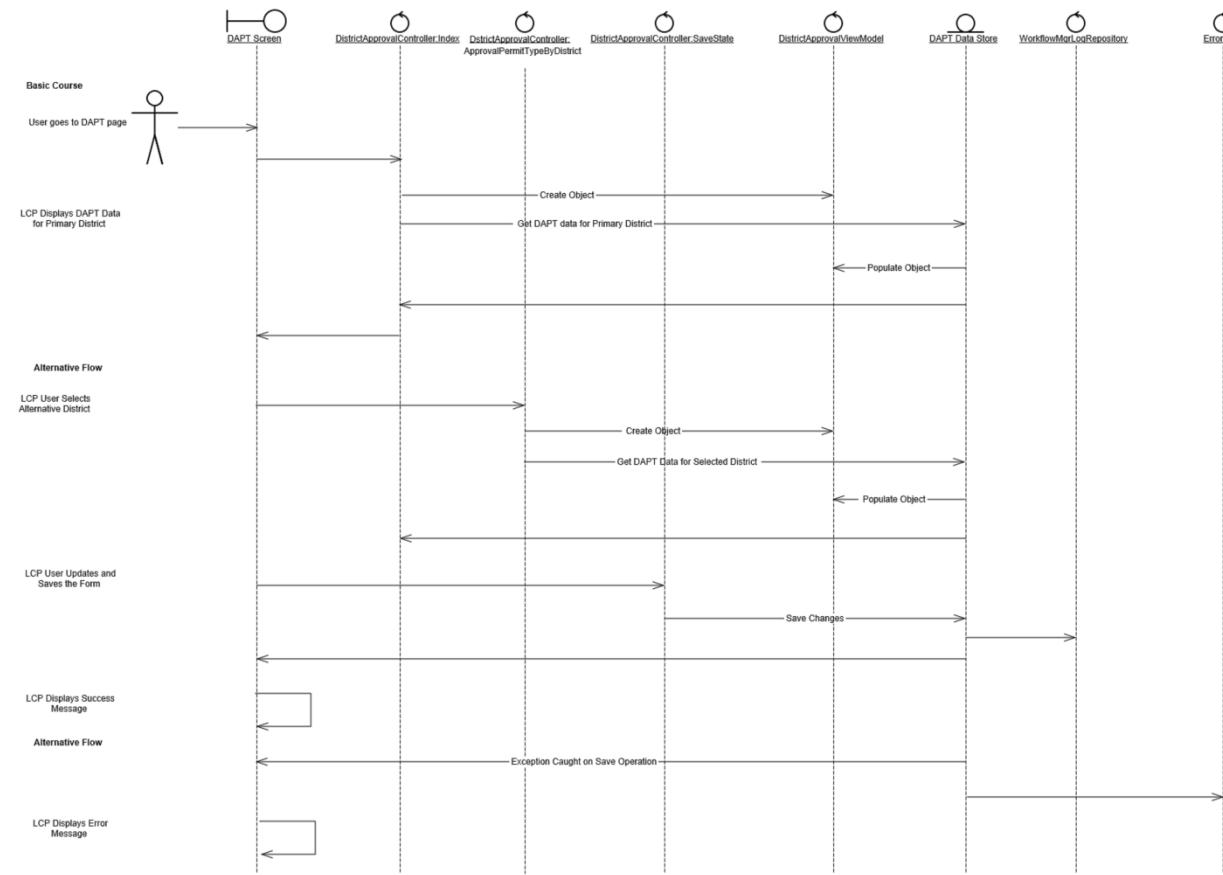


Figure 4-19 PR7094 Sequence Diagram

4.1.5 PR7107

4.1.5.1 Class Diagram

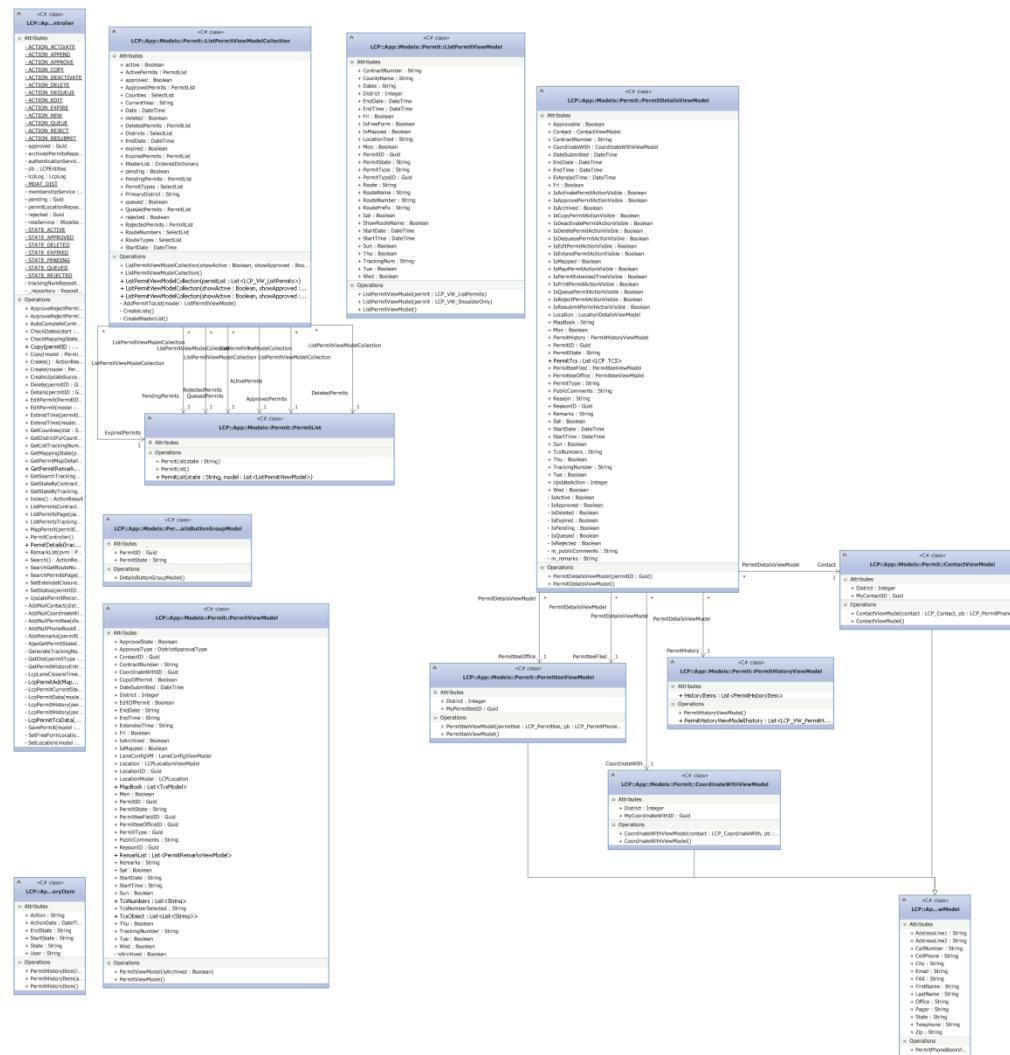


Figure 4-20 PR7107 Class Diagram

4.1.5.2 Sequence Diagram

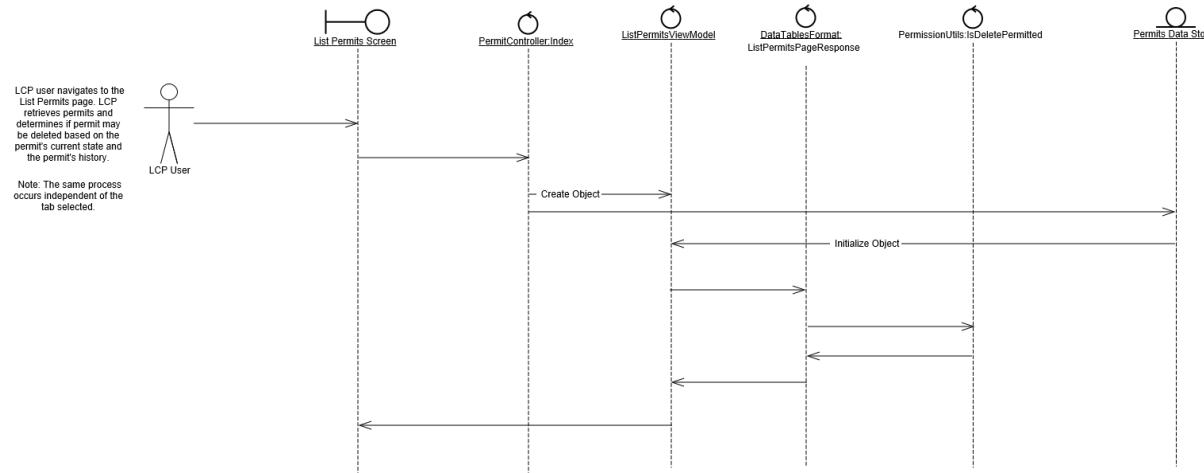


Figure 4-21 PR7107 Sequence Diagram 1

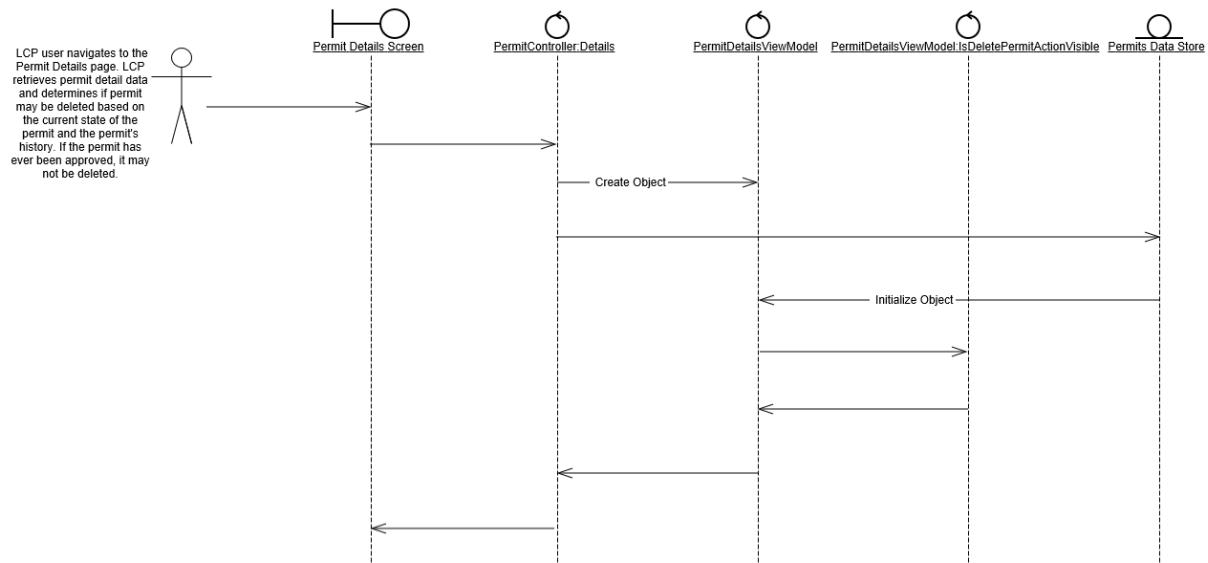


Figure 4-22 PR7107 Sequence Diagram 2

4.1.6 PR7174

4.1.6.1 Class Diagram

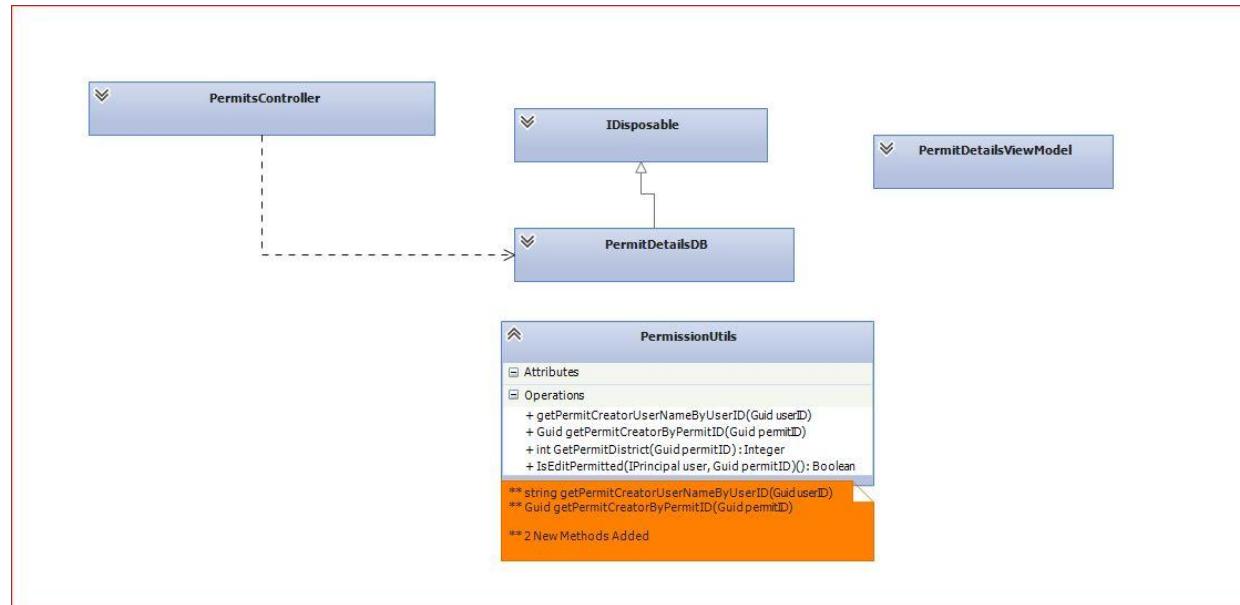


Figure 4-23 PR7174 Class Diagram

4.1.6.2 Sequence Diagrams

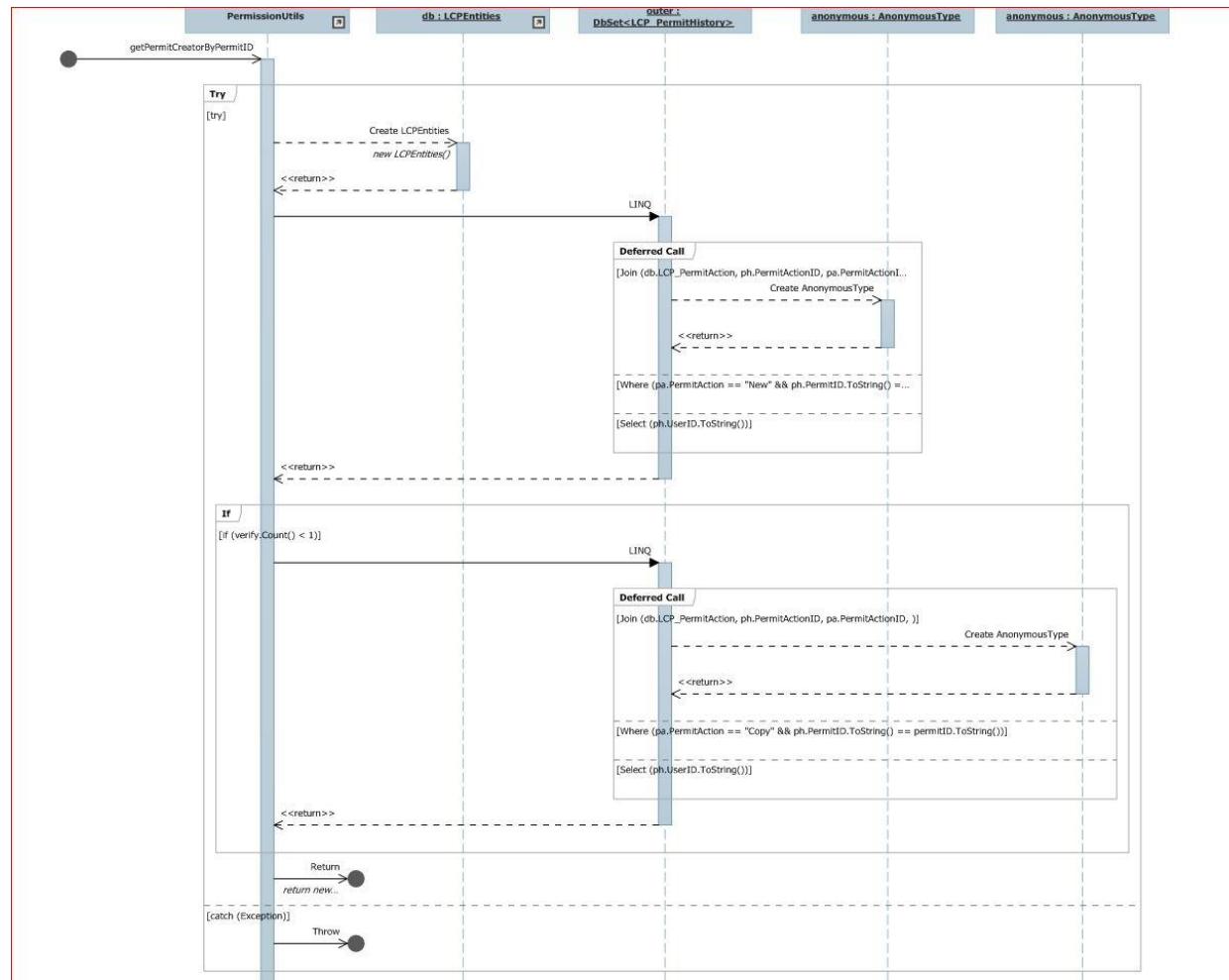


Figure 4-24 PR7174 Sequence Diagram 1

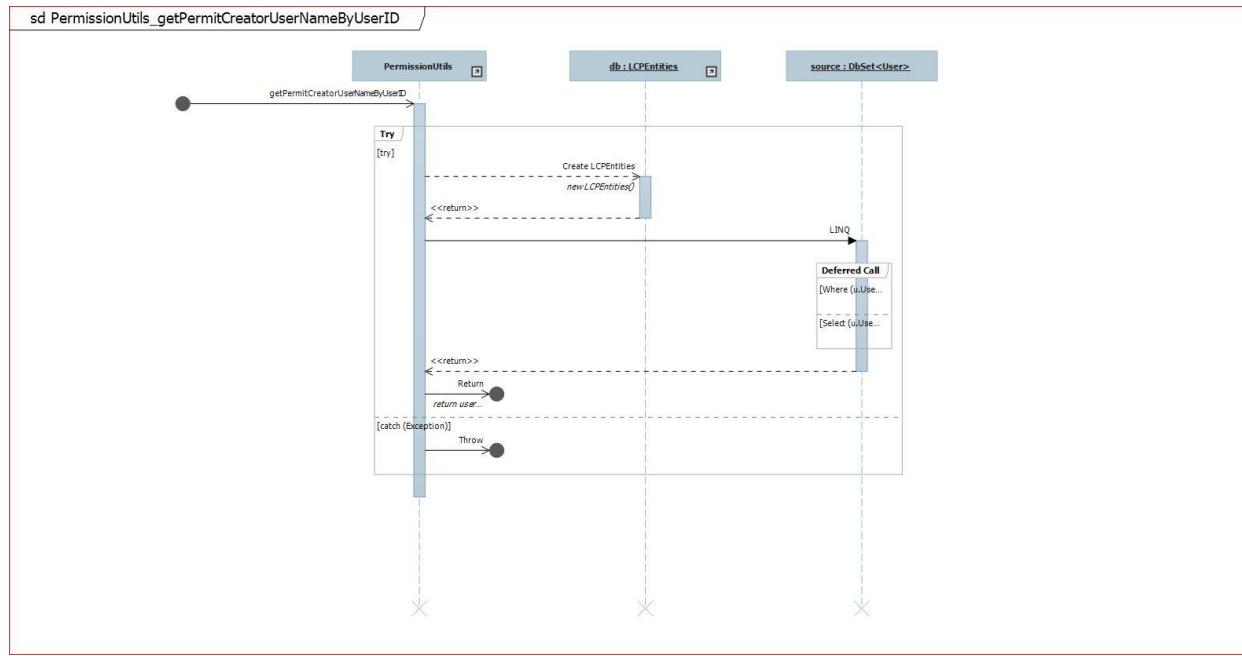


Figure 4-25 PR7174 Sequence Diagram 2

5 Acronyms/Glossary

LCP	Lane Closure Permits application used to manage SHA and MDTA lane closure permitting.
Home Page	The main page of the LCP application, always open if the user is logged in.
Permit	An LCP permit, providing information about roadwork that is permitted to take place.
RAM	Roadway Approval Manager
DPT	District Approval By Permit Type
WML	Workflow Manager Log
GIS	Geographic Information System (GIS) is any system that captures, stores, analyzes, manages, and presents data that are linked to location
Intranet Map	The CHART Mapping application that is not integrated into the CHART user interface.
REST	Representational State Transfer - a web services architecture style used in CHART that leverages web technologies such as http and XML